

BLM LIBRARY



88038233

John H. Poyd

Annual Report of the Secretary of the Interior



FOR THE FISCAL YEAR ENDING JUNE 30

1940

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

880 38233

HD
181
AS
1740

ANNUAL REPORT OF THE SECRETARY OF THE INTERIOR

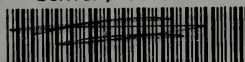


FOR THE FISCAL YEAR ENDING JUNE 30

1940

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON • 1940

BUREAU OF LAND MANAGEMENT LIBRARY
Denver, Colorado



~~880 38233~~

UNITED STATES DEPARTMENT OF THE INTERIOR

Harold L. Ickes, Secretary

•

For sale by the

Superintendent of Documents, Washington, D. C.

Price 75 cents (paper cover)

CONTENTS

REPORT BY BUREAUS AND DIVISIONS

	Page.
Letter of Transmittal	v
Bureau of Mines	1
Geological Survey	39
✓ Bureau of Reclamation	82
Bonneville Power Administration	127
✓ General Land Office	134
✓ National Park Service	162
Director of Forests	214
Petroleum Conservation Division	219
✓ Bureau of Biological Survey	223
✓ Bureau of Fisheries	291
✓ Grazing Service	330
✓ Office of Indian Affairs	354
Civilian Conservation Corps	401
Division of Territories and Island Possessions	408
Puerto Rico Reconstruction Administration	421
Division of Investigations	435
Office of the Solicitor	441
Bituminous Coal Division	451
Board on Geographical Names	469
War Minerals Relief Commission	471
Division of Information	474
Office of Exhibits	477
Interior Department Museum	479
St. Elizabeths Hospital	481
Columbia Institution for the Deaf	496
Freedmen's Hospital	499
Howard University	503

ILLUSTRATIONS

Frontispiece, power for the Northwest	facing page	v
Dig in for defense in mineral studies	facing page	xxxvi
Rock-dusting promotes mine safety	facing page	1
Eyes that see through rocks	facing page	1
Geologists examine Rocky Mountain regions	facing page	39
Dredging for gold in Alaska	facing page	39

	Page
Grand Coulee Dam nears completion	facing page 82
Field of wheat on a Wyoming reclamation project	facing page 82
Final step in land measurement operations by General Land Office surveyors	facing page 134
View in the New Kings Canyon National Park, Calif.	facing page 162
Bird banding important step in conservation . .	facing page 223
One of America's majestic elk	facing page 223
Fur seal on St. Paul Island, Alaska	facing page 291
More fish for mountain streams	facing page 291
Cattle furnish food and footwear	facing page 330
Wool on the Federal range	facing page 330
Indian silversmith's art	facing page 353
Indian youths solve motor troubles	facing page 354
Girls aid in office work	facing page 354
Examination guards Indian health	facing page 378
Taos Indian ceremonial dance	facing page 379
Pueblo tribal council in session	facing page 379
View of harbor, St. Thomas, V. I	facing page 408
Curing vanilla beans in Puerto Rico	facing page 421
Raising chickens new venture	facing page 421



POWER FOR THE NORTHWEST.

Surging currents of electric energy speed over these wires from Bonneville and Grand Coulee generators under the program of the Bonneville Power Administration to provide for industrial expansion and national defense requirements in the Pacific Northwest.

LETTER OF TRANSMITTAL
THE SECRETARY OF THE INTERIOR
WASHINGTON

MY DEAR MR. PRESIDENT: The Department of the Interior wrote a memorable record in the 12 months ending June 30, 1940.

As is well known, the Department deals with problems of wide scope and great complexity. To mention but a few examples: The Department of the Interior markets electric energy from the Columbia River. It opens irrigated areas in the semiarid regions for settlement. It serves as guardian of the Indians and protects their property. It locates and analyzes useful deposits of strategic and critical minerals. It cooperates with States in the conservation of petroleum and natural gas. It watches over our fish and wildlife. It develops better methods for the production and utilization of minerals and metals. It helps to improve technical processes in mining. It manages great forests and controls the public domain. It aids in the stabilization of the economy of Hawaii, Alaska, Puerto Rico, and the Virgin Islands; it has specified duties with respect to the Philippine Islands. It rebuilds and regulates the livestock ranges of the West. It preserves historic buildings and recreational lands in national parks. It fixes the minimum prices for bituminous coal. It conserves the Nation's water resources above ground and below the surface.

Through all of these activities runs a central thread—the conservation of our natural resources. The efforts of the Department are directed toward the improvement of the general welfare of our people through the intelligent development and use of our basic resources.

One of this Department's most significant social and economic achievements during the last year has been the placing on the public market of electric energy from the Columbia River. In December 1939 the first hydroelectric power from the generators of Bonneville surged over transmission lines into the Vancouver substation and thence across the river into Portland, and a great vision of years became an actuality. Under the direction of the Bonneville Power Administration, Bonneville power is vitalizing new defense industries, lighting homes, running factories, electrifying farms, producing new electrochemical and electrometallurgical plants, and seems well on the way toward stimulating a substantial development of the metals industries on the West coast. Bonneville and Grand Coulee power, marketed by a single agency, is destined to remake the economy of the Pacific Northwest. The ultimate results which can be produced by this enormous reservoir of power, unequalled anywhere in the world, are incalculable. Work likewise was pushed successfully on two other great projects. One of them is the Columbia Basin project, of which Grand Coulee Dam is the keystone. This

project will provide water for the irrigation of 1,200,000 acres of land in Central Washington, in addition to creating huge blocks of hydroelectric power. It will create a new region of stabilized farms in what is now a desert.

The second huge project is the Central Valley development in California. Inequalities of moisture, intrusion of salt water, and floods have threatened this verdant valley with ultimate destruction. This is the largest restoration project that we have ever undertaken, and it is progressing rapidly. Shasta and Friant Dams, located at each end of the valley, will regulate both the Sacramento and San Joaquin Rivers and provide adequate water to rescue approximately 2,000,000 acres of highly developed lands. These dams, moreover, will provide additional large blocks of hydroelectric power for the West coast.

In another sphere of activity our progress has been likewise steady. The sprawling bituminous coal industry is being stabilized as quickly as possible. The Bituminous Coal Division in the Department of the Interior went forward with the task of establishing minimum prices for bituminous coal. Stabilized prices in this vital industry will put it in a strong position to meet the demands of the defense program. I regard our work with the bituminous coal industry to be a form of economic buttressing which, in the long run, will prove to be of lasting benefit.

Another defense task which the Department was able to push forward during the year was the search for deposits of strategic and critical minerals. This work was undertaken jointly by the Geological Survey and the Bureau of Mines. Using the basic data accumulated by the Geological Survey, field parties made a careful investigation of deposits of those necessary minerals in which the United States is deficient and dependent upon imports for its supply. First results were more encouraging than was anticipated.

We have undertaken some changes in the Bureau of Mines. As a result of an alarming increase in coal-mine disasters, the Bureau of Mines changed its methods of reporting such accidents. The Bureau used to report the results of its investigations only to the industry, hoping that the latter would change its mining methods to reduce accidents. That system seemed to me not to be working. When the Bartley, W. Va., disaster took 91 lives in January 1940, I ordered that the Bureau make public the result of its findings. The factors in this frightful explosion were thus exposed to the public gaze. Other disasters were likewise reported publicly, and their causes placed on public record. The year's mining casualty record was appalling. Within 8 months, 3 terrible disasters occurred, with a loss of 226 lives. Our investigations showed that, if recommendations of the Bureau of Mines had been followed as thoroughly as they should have been, all of these disasters could have been avoided or at least greatly reduced in severity. The failure of coal-mining companies to enforce the safety practices which the Bureau of Mines has recommended to them, is, in my opinion, sufficient to warrant the enactment of Federal legislation giving power to the Government to enforce necessary safety measures.

In the preservation of natural areas and in the increase of our national parks, we enjoyed a successful year. Two new national parks,

Kings Canyon, Calif., and Isle Royale, Mich., were added, and an additional section was secured for Olympic National Park, Wash. Travel to the parks and public areas continued to increase at a phenomenal rate.

An important step in the consolidation of Federal conservation activities was taken early in the year. In pursuance of your reorganization plans, the Bureau of Biological Survey was transferred to this Department from the Department of Agriculture, and the Bureau of Fisheries from the Department of Commerce. These transfers, together with the establishment of the Bituminous Coal Division, vice the Bituminous Coal Commission, constituted an important three-ply conservation addition to the Department. The similarity of the work of the Biological Survey and that of the Bureau of Fisheries was such that it was possible to merge them. By the end of the year, they were coordinated and welded into a single unit, the United States Fish and Wildlife Service.

Many of the achievements of our Bureaus are worthy of detailed review. Nearly all contributed to the important program of national defense.

BUREAU OF RECLAMATION

During the fiscal year, Federal irrigation projects were prepared to serve more than 106,000 additional acres of new land. More than 23,000 acres were opened for settlement, providing new homes for approximately 261 farm families, dislocated by drought or other misfortune. The demand for this new land far outran the ability of the Bureau to supply. Since the Bureau was established, irrigation works have been placed in operation to serve nearly 4,000,000 acres of land, supporting approximately a million people. Under the present construction program, the largest in the Bureau's history, water will be provided for about 2,500,000 additional acres of new land and about 3,500,000 acres of insufficiently irrigated land to support another million people. The Bureau estimates that as many as 20,000,000 additional acres can be irrigated with water resources as yet undeveloped, under policies now in effect.

Power, an important byproduct of reclamation, loomed with fresh significance in connection with the national defense program during the year. The installation of power equipment and the construction of transmission lines were speeded up to furnish power for the manufacture of airplanes and for other defense industries. Known deposits of strategic minerals, the development of which might require large blocks of power, are located within transmission range or economical transportation distance of Grand Coulee Dam, Shasta Dam, and Boulder Dam. This fact brought special emphasis to power development in those regions.

As has been said, the Bureau's largest construction program is under way. At the close of the year, work was in progress on 27 projects in 13 States. Nine dams were under construction, with four storage dams and a diversion dam newly completed. Five of our dams rank as the world's largest concrete dams. They are Grand Coulee Dam of the Columbia Basin project; Shasta and Friant Dams of the Central Valley project; Boulder Dam, and Marshall Ford Dam of the Colorado River project in Texas.

Grand Coulee Dam, key control feature of the Columbia Basin project, was nearing completion at the close of the year. Economic investigations and soil surveys of the irrigable lands of the project were being successfully pursued. The construction of the Leavenworth station for the conservation of migratory fish in the Columbia River is almost completed.

Excavation work at both Shasta and Friant Dams progressed at a rate that made possible the pouring of concrete. These two dams will regulate both the Sacramento and San Joaquin Rivers.

With eight of the large 115,000 horsepower and one of the smaller 55,000 horsepower units in operation at the Boulder Dam Power Plant, output was almost doubled during the fiscal year. The gross income during the year, including power receipts and payments on power machinery by the lessees, totaled \$5,360,000.

In California the 80-mile All American Canal was practically completed, and progress was made on the 130-mile Coachella Branch Canal, one 40-mile section being completed and work advancing on another 40-mile section. Together these two canals will carry water from the Colorado River to irrigate 1,000,000 acres of rich land, in the Imperial and Coachella Valleys in southern California.

In Colorado, work was under way on Green Mountain Dam and the Continental Divide tunnel, two important features of the Colorado-Big Thompson project. This will provide a supplemental water supply for 615,000 acres of land now under cultivation, situated east of the Rocky Mountains.

Funds appropriated for the fiscal year 1941 make possible the continuation of the work at Marshall Ford Dam on the Colorado River to a height of 271 feet for flood control and power generation. The construction of the dam to the 190-foot height was advanced to 97 percent of completion, and bids had been received for the additional height at the end of the year.

The year's work brought the accomplishments of the Bureau to impressive totals. In its 38 years of existence, the Bureau has completed a program embracing 161 storage and diversion dams; 51 powerhouses; 3,058 buildings; 20,575.9 miles of canals, ditches, and drains; 878 miles of tunnels; 4,802.5 miles of telephone lines; 300.5 miles of dikes; 6,377 flumes; 21,525 culverts; 13,912 bridges; and 202,491 other irrigation structures. Reservoirs of the Bureau have a combined capacity of 51,215,000 acre-feet of water. Crops valued at \$114,082,794 were produced, an increase of \$619,334 over the previous year.

The reclamation fund is decreasing. By the close of the 1941 fiscal year it will be so depleted that the Bureau will be unable to carry on the construction of its projects. Either the reclamation fund should be increased by an advance from the general fund of the Treasury, or certain of the more costly projects now being constructed should be financed by appropriations from the same source, or some other source of revenue should be found.

BUREAU OF MINES

On June 30, 1940, the Bureau of Mines completed its first three decades of service. Since its establishment in 1910, it has undertaken a flexible program to promote safety in the mineral industries,

to conserve mineral resources, and to conduct investigations of the mining, preparation, and utilization of minerals. This year these activities paid remarkable dividends.

As in the emergency of 1917-18, the Bureau of Mines was able this year to devote much of its effort to preparations for the national defense. The Bureau, in cooperation with the Geological Survey, examined 163 deposits containing ores of strategic minerals and sampled 10 others, representing possible sources of antimony, chromium, manganese, nickel, tin, and tungsten. Three deposits disclosed important quantities of strategic minerals. Moreover, in antimony and mercury this country may become self-sufficient, if foreign supplies should become inaccessible.

The Bureau's work was not confined to the prospecting and sampling of deposits, however. Utilizing the tremendous, newly developed hydroelectric facilities of the West, the metallurgical staff made notable advances in developing processes for the recovery of strategic metals (including chromium, manganese, and magnesium) from low-grade or off-grade domestic ores.

The Bureau of Mines compiles statistics on the source, production, consumption, and stocks of minerals. This makes it possible to supply up-to-date, quick, and reliable data to the Army and Navy Munitions Board (especially in connection with stock-piling plans) and to the Advisory Commission to the Council of National Defense, as aids in determining defense policies.

Few people realize the care with which the Bureau is handling the Nation's motor-fuel problem. The Bureau's petroleum engineers are trying to make America's oil resources last as long as possible by showing the industry what it must do to avoid waste. The Bureau is also testing painstakingly all sorts of low-rank American coals to determine their suitability for treatment by the hydrogenation process to yield gasoline. The importance of synthetic gasoline plants to a motorized army is seen from the fact that Britain's Royal Air Force is persistently bombing such plants in Germany.

The Bureau of Mines, Amarillo plant, which enjoys a world monopoly on the production of the lightweight, noninflammable helium gas, completed production of its first 100,000,000 cubic feet about the end of the fiscal year. It is now in a position to supply any military demands that might be made. Its present capacity, which can be expanded, is 2,000,000 cubic feet of helium a month. Helium was utilized first to lift lighter-than-air craft, but is now being applied also to an increasing variety of humanitarian uses, including the treatment of respiratory diseases, administration of anaesthetics, and the prevention of ear block after work at high pressures. It is of interest to note that we are able to sell helium at its cheapest non-Government rate for medical use—\$12.80 per thousand cubic feet—compared to as high as \$150 before the act of September 1, 1937 was passed.

For generations, American manufacturers of sanitary and refractory wares and other ceramics have firmly believed that other countries, principally in Europe, were the only sources of satisfactory raw materials. Now that deliveries from abroad are uncertain and, indeed, drastically cut because of their great bulk and low value, the American ceramists are seeking supplies at home. The Bureau of

Mines has been steadily improving methods of preparing clays and other raw materials from American deposits. It has been conducting successful firing tests on refractories, china, and sanitary wares in the Pacific Northwest, where hydroelectric power from the Grand Coulee Dam is available, and in Tennessee, which is served by the Tennessee Valley system.

Over 1,360,000 first-aid and mine-rescue courses have been given by the Bureau of Mines in its first 30 years, including 986,000 in the coal-mining industry alone. In an endeavor to comply with the requests of the mining industries, the Bureau has emphasized training activities. The unusual number of coal-mine disasters in the past few months, however, points to the need for focusing increased attention on accident prevention.

During the first 8 months of 1940 there have been a number of unfortunate disasters in the coal-mining industry. While 1939 had but one major explosion with a total of 28 deaths, there were three explosions in the bituminous coal mines in the first 8 months of 1940: one, in January, in West Virginia with 91 deaths; one, in March, in Ohio with 72 deaths; and one, in July, in Pennsylvania with 63 deaths. This makes a shocking total of 226 fatalities up to July 15—the greatest number since 1928, when there were 14 major disasters with a total of 326 deaths.

The excessively high average number of fatalities per disaster is as disheartening as it is inexcusable. There is absolutely no question that if known safety procedures were followed in bituminous mines, widespread explosion disasters would be reduced to the vanishing point.

Another disturbing trend in connection with major disasters since 1933 is that, of six coal-mine explosions with a loss of 25 or more lives, all have occurred during the past 3 years. Moreover, five of the six have been in highly mechanized mines. In four of the five the explosion was caused by the blasting procedure; and the sixth (at Sonman, Pa., which occurred in a hand-loading section) was initiated by a machine (a trolley locomotive). This very strongly indicates that while mechanization of coal mines has many undoubted advantages, it also presents hazards which are not being safeguarded as adequately as they should be.

THE BONNEVILLE POWER ADMINISTRATION

On December 1, 1939, the Bonneville Power Administration's first high tension transmission lines, two 40-mile circuits between the Bonneville Dam and Vancouver, Wash., were completed. A few hours later electric power from the Columbia River was being delivered to the Portland metropolitan area. The vision of years—the harnessing of the Columbia River—had become an actuality, and the latent energy of this great western stream had been put to work to produce public power for the people of its territory.

Years of intensive preparation at Bonneville bore dramatic results during the 1940 period. At the beginning of the year, major transmission lines were only partly constructed or existed upon engineers' blueprints. At the end of the period, two 43,200-kilowatt generators were in operation; two 54,000-kilowatt generators were being in-

stalled; 660 circuit miles of transmission line were in operation; 449 additional miles of line were under construction, and 189 miles were ready for contract. A total of 101,350 kilowatts of firm power had been contracted for by industries, municipalities, public utility districts, and private utility companies. Power was surging over the wires at the lowest wholesale rate in America—\$17.50 a kilowatt year at any point on the line. Deliveries ranged as high as 91,000 kilowatts—more than the rated capacity of the generating units. The power contracted for was in excess of the installed capacity at the powerhouse.

With the delivery of power came its corollary—industrial development. Attracted by the large amounts of cheap power which the project is making available, came important metal and chemical industries. The construction of the first aluminum reduction plant west of the Mississippi River was put under way by the Aluminum Co. of America. Shortly after the close of the fiscal year, actual production of aluminum was started with Bonneville power.

This, of course, meant a new source of aluminum supply for the country's defense needs and for peacetime use. Most of the first production was for use in airplanes for the Army and Navy. Thus one of the first dividends to be paid back to the people of the United States on their investment in this project was in the form of modern equipment for national defense. The Aluminum Co.'s first demand of 27,000 kilowatts of energy will be increased progressively until it will be producing on a basis of 60,000,000 pounds of metal a year. Estimates indicate that this amount of aluminum, if converted to airplanes, would provide for the manufacture of any of the following groups of planes: 1,500 Boeing Flying Fortresses; 13,000 Curtis Hawk 75's; 9,200 Douglas Attack Bombers; 7,000 Twin Engine Attack Bombers; 12,000 North American Dive Bombers; 13,000 Šivirsky Pursuit Ships, or 20,000 Grumman Fighters.

Other industrial contracts for Bonneville power were signed with the Sierra Iron Co., which has planned a plant for pig iron production, and with the Pacific Carbide and Alloys Co., an electro-chemical firm. The importance of this industrial expansion to the national defense cannot be overemphasized.

Eight months after the first power reached the Vancouver substation, the Bonneville Power Administration had executed 23 contracts calling for delivery of 106,850 kilowatts of energy. Of these contracts, 5 were with public utility districts; 10 with municipalities; 1 with an R. E. A. cooperative; 3 with private utilities, and 4 with industries. These contracts, together with prospective sales, assured the Administration revenues during 1941 of \$1,880,000 and of \$4,000,000 in 1942. With power actually available, an increasing number of industrial inquiries were received by the Bonneville Administration relative to possible location of plants. The signing of a considerable number of additional industrial contracts may be expected during 1941.

The extension of the Federal transmission system into all sections of the Pacific Northwest is a guarantee that Columbia River power will be available to all types of distributors and industries at the same low wholesale rate. The interconnection of the Federal system

with other generating plants, both private and public, will assure the Pacific Northwest one of the most dependable supplies of power in the United States. When all the generators are installed at Bonneville and Grand Coulee, they will produce more than 2,400,000 kilowatts. This is more than a million kilowatts greater than will be available from all 10 dams of the Tennessee Valley Authority.

It became apparent during the year that the proximity of the Bonneville and Grand Coulee Dams made it desirable that some common method be established for marketing the large amount of power that the two will produce. Both dams serve the same general area and their location and interconnection will make possible complete service for the Pacific Northwest area. Shortly after the close of the year the organization along these lines was so far advanced that it was possible to promulgate your Executive Order designating the Bonneville Power Administration as the common marketing agency for the power from both projects.

The social and economic significance of the development of 2,400,000 kilowatts of cheap electric energy in the Northwest is enormous. It is impossible at this time to foresee the final results, but the general shape of the things to come in that part of the Nation may be discerned from present trends. Properly administered, this source of energy should have a profound effect in promoting a better physical distribution of industries in this country. It can help to disperse the heavy concentration of industry in the northeast corner of the Nation by making it possible for it to go elsewhere, thus helping to relieve a potentially dangerous military situation inherent in a geographically concentrated industry. With intelligent direction and proper use, it will bring a whole section of the Nation closer to self-sufficiency and will modify the present dependability of that area upon distant centers of industrial production. It will make possible local processing of the natural resources of the northwest and open new avenues for the general betterment of our people.

BUREAU OF BIOLOGICAL SURVEY

With the transfer of the Bureau of Biological Survey from the Department of Agriculture, in accordance with your Reorganization Plan No. II, the Department became primarily responsible for administering the wildlife of the Nation. This national resource, wisely managed, makes important, though in many respects intangible, contributions toward a national strength that is more essential than ever in times of emergency. That country is worth dying for which is worth living in. Conserving wildlife is one way of making a country worth living in. Vacations spent outdoors, in hunting and fishing or in studying and photographing wildlife, develop healthy, happy citizens with a genuine regard for liberty.

The Department has made much progress this year toward perfecting an organization that will promote efficiency in wildlife conservation. The wildlife division of the National Park Service was transferred to the Biological Survey, and there has been a closer coordination of the Survey's work with other agencies of this Depart-

ment. Arrangements for continuing the Bureau's cooperation with its former associate agencies in the Department of Agriculture were effected. And, finally, on the last day of the fiscal year, in accordance with Reorganization Plan No. III, the Biological Survey and the Bureau of Fisheries were consolidated to form the Fish and Wildlife Service. As a result of these changes the Federal Government enters the fiscal year 1941 better organized than ever before to carry on work in wildlife conservation.

Activities of the year were largely concerned with the prosecution of programs already under way, with the result that wildlife conditions in general were again better at the end of a year than at its beginning. This indicates that the Nation is at last on its way toward the restoration of this once abundant natural resource. The most recent of the major programs, providing Federal aid to the States in wildlife restoration, increased in effectiveness during this, its second year. Appropriations were increased from \$1,000,000 to \$1,500,000, and the wildlife conservation projects undertaken by the States grew from 57 in the first year to 237 in 1940. These new refuges were added to the national wildlife refuge system, bringing the total to 263, with an acreage of 13,635,363. In these areas there were noticeable increases in the wildlife populations.

Partly as the result of this refuge program under favoring climatic conditions, but largely as the outcome of the careful regulation of hunting and the strict enforcement of the game laws, a general increase in migratory birds was noted for the fifth consecutive year. The same intensive scientific investigations that revealed these increases, however, also indicated that some species, notably woodcocks and doves, had suffered severely from winter storms during their stay in the South. Precautionary measures were taken to give these birds additional protection during coming seasons.

Wildlife administration has continued to include not only encouragement of desirable species but also intelligent restraint of species that do damage. Control of destructive mammals and birds, carried on more efficiently than ever as a result of the operations of and demonstrations by the Biological Survey, takes on added significance during a national emergency in which food supplies become of critical importance. However, it must be the recognized policy that control should never exceed the demonstrated need for it.

It is to be borne in mind that, although intelligent wildlife administration can further the purposes of national defense, there is need, as with other resources, for extreme caution against a perversion of patriotic zeal that might endanger an important endowment that must be defended. Wildlife conditions in the United States are not yet what they should be. The favorable conditions that do exist are the result of years of planning and of carrying out corrective measures that were sorely needed as the result of unheeding exploitation. The wildlife resource is not a storehouse to be exploited during any presently conceivable period of stress. In emergencies as well as in all future years, the Nation must continue to maintain its now firmly established purpose of restoring wildlife to something approaching its former abundance. It must prudently conserve this great natural resource as one of the American requirements for good living.

BUREAU OF FISHERIES

Throughout the past year the Bureau of Fisheries has continued in its efforts, by precept, example, and regulation, to maintain the fisheries of the United States and its possessions at a level of abundance sufficient to care for current needs and to assure future supplies. To this end the Bureau has conducted investigations and made recommendations which have made possible a more complete utilization of fishery products and byproducts, improved methods of controlling natural enemies of commercially important species, and the adoption of gear and methods of fishing which make possible an escapement sufficient to perpetuate the resource.

During 1938, the most recent year for which complete statistical data on the commercial fisheries are available, the landings of United States fishing craft totaled over 4,250,000,000 pounds. The wholesale value of the products derived from the fisheries was in excess of \$251,000,000. About 250,000 persons were employed in the capture, processing, and wholesaling of the catch.

Throughout the year the Bureau operated 110 fish-cultural stations which produced, distributed, and planted nearly 7½ billions of fish and eyed fish eggs in the coastal and inland waters of the United States. While the major portion of this output was in connection with the conservation of commercial species, more than 151 millions were of the various species which almost exclusively concern sport fishing.

Although statistics of sport fishing for the year are not yet complete, available figures indicate that there has been a substantial increase over the 1937-38 period when it was estimated, from figures supplied by various State agencies, that more than 12 million persons engaged in sport fishing. These figures also indicate that the total expenditures of sport fishermen during that period—fishing licenses, fishing tackle, special clothing, transportation, meals and lodging, boat and guide hire, and the like—were in excess of 875 million dollars.

The Fishery Market News Service, whose function is the regular dissemination of important fishery market information, continued to expand its services. It opened an office in New Orleans, La. This new unit constitutes the sixth of a series of offices which have been set up in carefully selected localities throughout the country. Through these offices it has been possible to release market data covering about one-half of the annual domestic catch of edible sea foods. Additional market news offices will be established from time to time as funds permit, and in the order of their possible service, not only to commercial interests, but to consumers as well.

Through the issuance of daily and monthly published market reports on landings, cold-storage holdings, movements, prices, and other pertinent market data, and through daily radio reports, the Fishery Market News Service is promoting the orderly production and distribution of sea foods. Not only does the fish industry realize the many benefits and opportunities which result from this comprehensive and dependable service, but producers and consumers likewise benefit from it.

In connection with various phases of scientific fishery investigation, the fish-cultural program, and the patrol of Alaskan fisheries, the

Bureau maintains and operates a fleet of 20 vessels, totaling 1,718 gross tons, which, during a national emergency, could be converted into naval auxiliary craft and be placed at the disposal of the Navy. This fleet is supported by numerous small speed and other types of boats which might also serve in some defense capacity, should the need arise.

GEOLOGICAL SURVEY

Continuing its authorized investigations in scientific and engineering fields, the Geological Survey stressed those features of its work most important to national defense. In geologic and related investigations, for example, the Survey carried forward its regular program, and with the aid of a small appropriation which became available on August 10, 1939, made special studies of strategic minerals. These included manganese, antimony, quicksilver, chromite, and others that are so essential in defense but of which our domestic supplies are inadequate in quantity or low in grade. During the year brief reports were prepared on eighteen special strategic-minerals projects. By committee service, and in other less formal ways, the Survey's specialized information in the mineral field was made available to the defense agencies.

Shortly before the close of the fiscal year Congress appropriated a little less than \$2,000,000 for making topographic surveys and maps in strategic and other areas during 1941. This is a slight increase over the amount available in 1940 and it is hoped that it is indicative of a trend toward an accelerated mapping program by the Geological Survey. However, it is less than half the amount immediately needed and recommended by the Interior and War Departments. Adequate topographic maps are important under any conditions in all planning and development that involves the use of the land, but they are particularly essential to successful military operations. About 25,000 square miles in the United States and its dependencies were mapped in 1940.

Spectacular floods and droughts in recent years have continued to hold national attention to the role of water in the national economy. Direct destruction by floods, and the shift of population brought about by droughts, have greatly disturbed what had come to be regarded complacently as normal developments. They have forced whole regions to recognize that they had been forming conclusions from an inadequate foundation of fact; from an insufficient knowledge of water supplies.

This in turn has led to increased demands for knowledge about stream flow and underground water sources. As a result, each year larger sums have been made available to the Survey for obtaining and analyzing the technical basic data necessary to the proper control and sound utilization of water. Work done for the Army engineers, who supervise flood-control investigations, in 1940 exceeded the record of any previous year.

A special detailed mapping project in Alaska was undertaken at the request of the War Department. The Geological Survey's staff of specialists in Alaskan work also made examinations of strategic minerals in the Territory.

The Survey's work in administering the land classification and mineral leasing laws was also of great importance. In 1940, the Survey made more than 7,500 reports regarding the mineral resources, water power, or storage possibilities of public lands and at the same time safeguarded great Government reserves of coal, oil and gas, potash, phosphate, and other minerals. About \$8,000,000 were received by the Federal Government from lessees and permittees operating on public and Indian lands and from naval petroleum reserves supervised by the Geological Survey.

NATIONAL PARK SERVICE

The National Park Service has had an exceptionally successful year. The number of units in the Federal park system was increased during the 1939-40 period from 154 to 161. The addition of new units and adjustments of boundaries of existing parks increased the total area from 20,817,228 to 21,550,783 acres. More than 15,450,000 persons visited the parks during the travel year ending September 30, 1939. The travel for the period from October 1939, through September 1940, reached the all-time high of 16,741,855 persons. Winter-sports travel was exceptionally heavy. The United States Travel Bureau, which promotes and encourages travel to and within the United States, was placed on a statutory basis by legislation signed by the President on July 19, 1940.

Outstanding conservation achievements were the establishment of the Kings Canyon National Park, Calif., the Isle Royale National Park, Mich., and an important addition to the Olympic National Park, Wash. The creation of the Kings Canyon National Park brought to a successful conclusion a 60-year conservation effort. Absorbed in the Kings Canyon was the 4-square-mile General Grant National Park.

Abraham Lincoln's birthplace, in Kentucky, formerly classified as a national park, was designated the Abraham Lincoln National Historical Park, and Fort McHenry National Park in Maryland was given the more appropriate status of national monument and shrine.

In the District of Columbia the National Capital Parks system and its appurtenances continued to expand in areas and in services to the public. Work continued on the historic Chesapeake and Ohio Canal to develop its unusual recreational potentialities. Additional lands were added to the George Washington Memorial Parkway. With these recent developments, and others pending as the fiscal year came to a close, the park system of the National Capital will be the largest of any city in the United States. If Washington is to continue to merit the distinction of being one of the world's most beautiful capitals, it is imperative that additional funds be available for the maintenance and operation of its parks and national memorials.

Preservation of historic Cumberland Gap, in Virginia, Kentucky, and Tennessee, was authorized by Congress, with the proviso that the lands within the approved boundaries be donated to the United States.

Excellent progress was made on the Blue Ridge and Natchez Trace Parkways. The Skyline Drive in Shenandoah National Park, Va., connecting with the northern terminus of the Blue Ridge Parkway, was completed.

Information concerning the National Park Service and its activities was disseminated to a world-wide audience through the press, by radio, illustrated lectures, literature, and picture service. Wildlife research activities of the National Park Service on January 1 were transferred to the Bureau of Biological Survey. Improvement of wildlife range conditions continued to be the chief wildlife management activity in the Federal park system.

In cooperation with P. W. A., work was continued on the important Historic American Buildings Survey, the purpose of which is to measure and photograph historic structures or those of architectural importance.

Engineering research resulted in the development of a new type of radio antennae for park-ranger patrol cars. Airplane patrols supplemented the customary dog-sled surveillance in Mount McKinley National Park, Alaska. Insect- and tree-disease control was continued. The importance of this activity may be understood when it is considered that the White-pine blister rust in the sugar-pine forests of California ranks next in importance to fire as a menace.

The broad program of conservation and recreation development was continued with the assistance of 310 continental C. C. C. camps in 90 national parks and monuments, 22 recreational demonstration areas, and 198 State, county, and metropolitan parks.

The major problem facing the National Park Service at this time is a shortage of permanent civil-service personnel. The many new activities and additional areas coming to the Bureau have been manned largely by excellent but temporary non-civil-service personnel, principally from W. P. A., P. W. A., C. C. C., and E. R. A. The gradual reduction of such personnel during the past three years leaves the Service not only undermanned, but facing a loss of more than half of its present operating personnel should the emergency programs be closed suddenly. On June 30, 1940, the total personnel was 7,340 employees. Of these, 3,956 held emergency non-civil-service appointments. With employee reductions occurring periodically—frequently several times a year—it is urgent that the Service be placed on a firmer basis with regard to personnel if it is to continue to maintain and operate the Federal park system in accordance with the purposes of Congress.

At the close of the year, Director Arno B. Cammerer was forced by ill health to request that he be relieved of the heavy duties of the directorship of the Service. He was replaced by Newton B. Drury of California.

OFFICE OF INDIAN AFFAIRS

At a time when totalitarian governments abroad are crushing individual conscience and will, it is heartening to witness the tenacious clinging of the Indian to his local democratic institutions. In the United States (and throughout most of the Americas) the Indians have suffered repression for more than 200 years, but in spite of this the local democracy of the Indians has not been destroyed, nor have their institutions been fundamentally modified. Now that these repressions are being lifted, under wise government policies, the Indians of the Americas are emerging to play, in many of the countries, an

important, if not a decisive, role in the struggle for the maintenance of democratic institutions.

The Indians of the United States offer an example for nation-wide conservation by their own efforts to preserve their lands. It was no accident that the Indians turned over to the white man a continent unexploited and uneroded. Conservation is basic in Indian cultures. Always the unity of the Indian with his land was a unity of use, of conservative use, of planned use.

No groups in the country at present are making greater voluntary sacrifices to save their lands than are the Navajos, many of the Pueblos, the Hopis, and others. Tribes that are most archaic in their social forms, such as that of the Acoma Pueblo, have adopted modern technologies of land conservation, range management, animal husbandry, and marketing.

The Indians are growing in numbers at a more rapid rate than any other segment of the population. This is undoubtedly due to the efforts of the past 7 years to help them achieve economic rehabilitation, to wipe out the dread scourges of trachoma, tuberculosis, and other diseases, and to renew the spirit to live through restoring their confidence, prestige, and self-government. This is furthered through intelligent programs of community services, better law and order, and the encouragement of their native arts, crafts, and ceremonials.

The future of the Indian was never, since the white man came, so bright as at this hour. For example, there has been a striking resurgence of Indian arts and crafts. Indian-made rugs, jewelry, baskets, pottery, and other craft objects have taken on a new dignity and prestige under the program to stimulate the fashioning and sale of high quality, authentic Indian wares. The sale of tourist knick-knacks, often represented as authentic Indian goods, has in the past done much to lower the standards of value of native handicrafts. Now, a radically different attitude toward Indian goods has been manifested throughout the country. The campaign to stimulate the production and marketing of better Indian objects is only in its infancy, but it is a very lusty infant.

Native Indian art is advancing because traditional talents are being carefully fostered by skilled teachers. Indians have won conspicuous artistic acclaim through some of their mural decorations, notably on the walls of the Interior Building in Washington and in public buildings elsewhere. One Indian boy, aged 17, won the first prize in a Nation-wide competition in which more than 52,000 contestants participated.

Conservation activities have been too numerous and too diversified to make possible an itemization of recent developments. In Alaska the Eskimos are dependent on their reindeer for food and clothing. After careful and exhaustive studies by the Government, provision was made to purchase all of the nonnative owned reindeer and to turn these over to the natives, where under Federal guidance, proper conservation measures could be effected and pursued. There is hope now that this splendid native people will be able to protect their way of life and become increasingly self-supporting.

On the semiarid stretches of the Navajo Reservation in Arizona, New Mexico, and Utah, a vital part of the program of conservation

has been the necessity to make clear to Indians the intricacies and the importance of modern soil conservation methods. To accomplish this, in part, a new Navajo alphabet has been developed and put into use with helpful results already manifested. Another phase was a huge round-up of wild horses undertaken as a means of disposing of these economically unproductive animals. To the Navajo, the horse is a symbol of prestige, and the fact that he consented to part with his horses indicates the extent to which the need for soil-saving has become apparent.

Indians are developing some remarkable abilities as businessmen. Many tribes, some of them mistakenly considered "backward" and "primitive," have responded surprisingly to new responsibilities given to them under the Indian Reorganization Act, the Oklahoma Act, the Alaska Act, and the present general policy of giving Indians an increasing measure of self-government.

Indian judges are administering Indian law on many reservations with much of the dignity and prestige of the leaders of another day. Indian tribal courts have been revived, increased, and strengthened and the Indians are rising to the new responsibilities involved.

Indians are being employed in their Indian Service in steadily increasing numbers. In striking contrast to the situation 10 years ago, there were in October 1939, 4,669 Indian men and women on the permanent employment rolls. This number has grown considerably since that date. In addition, 13,771 are employed in emergency jobs, including the Indian Division of the Civilian Conservation Corps, a separate segment of the C. C. C.

Numerous skills and talents have been developed among Indians and many of the more important official positions are being filled by Indians. Many Indians trained to take jobs outside of the Service are not only being placed in positions, but are making noteworthy successes therein.

Indians of the United States are reflecting in a great many ways their awareness that for them a new day has come. With new advantages they are acquiring new responsibilities and, thus far, they have shown willingness and capacity to meet both the problems and the opportunities.

THE DIVISION OF TERRITORIES AND ISLAND POSSESSIONS

During the year the Division continued its administrative functions of coordinating Federal activities relating to Alaska, Hawaii, the Equatorial Islands, Puerto Rico, and the Virgin Islands. The Philippines were brought within the Division at the beginning of the fiscal year, when they were transferred from the War Department under Reorganization Plan No. I.

On June 24, 1940, Dr. Rupert Emerson took over the duties of Director of the Division of Territories and Island Possessions, succeeding Dr. Ernest Gruening, who was appointed Governor of Alaska.

ALASKA

Activities throughout the Division have expanded considerably due to the vast defense programs which have been inaugurated in some of these areas. For Alaska, where Army and Navy air bases

are being rushed to completion at various strategic points, the Department of the Interior is supporting a bill (S-3577) which would make possible accelerated development and colonization of this sparsely settled Territory. The plan, in effect, would provide "a defense behind the defense" in the form of an active population to furnish needed supplies and services to the regular troops which will be stationed there. It is generally conceded that new activities and industries must be developed in Alaska if the Territory's economy is to be built up and maintained.

HAWAII

During the year, the Division of Territories maintained a close interest in the program of sugar legislation now before the Congress, constantly attempting to secure adherence to the basic principle that Hawaii, and also Puerto Rico and the Virgin Islands, be accorded the same treatment as other sugar producing areas under the American flag. Sugar remained the primary industry of Hawaii. Shipments to the mainland were valued at \$55,217,960.

THE EQUATORIAL ISLANDS

In accordance with the terms of a license issued by the Department of the Interior in behalf of the United States Government, Pan American Airways, Inc., has established equipment and personnel on Canton Island in connection with the operation of its trans-Pacific air transport service. Inasmuch as Pan American Airways contemplates permanent occupancy of Canton Island, consideration is being given to the withdrawal of the four Department of the Interior employees now stationed there.

THE PHILIPPINE ISLANDS

An amendment by Congress on August 7, 1939, of the Independence Act of 1934, provides for a more orderly adjustment of the Philippine economy prior to political independence.

In the Philippines, steps were initiated to provide for three amendments to the Philippine Constitution: One, to permit the re-election of the president, and to substitute 4-year terms for the existing 6-year term; another, for the re-creation of a bicameral legislature to replace the unicameral legislature now existing; and a third for the establishment of an independent committee on elections. These were approved by the people of the Philippines in a plebiscite held on June 18, 1940, but at the end of the fiscal year they had not been submitted to you for consideration.

All reports indicate that the Commonwealth government is at the present time in an excellent financial condition. However, the Islands are faced with a tremendous problem of economic adjustment inasmuch as, under the terms of the Independence Act, they will lose the privileges of free trade with the United States in 1946. The seriousness of this problem is well recognized in the Philippines and some steps are being taken to readjust the Islands' economy. However, much remains to be done.

PUERTO RICO

The finances of the Insular Government continued in a satisfactory condition. Business conditions improved during the year, although there is still much unemployment. This is due in part to the quota on sugar, and to the closing of needlework factories since the enactment of the Fair Labor Standards Act. A committee has been appointed by the Wage and Hour Division to investigate conditions pertaining to the needlework industry in Puerto Rico, and to recommend minimum wage rates.

THE PUERTO RICO RECONSTRUCTION ADMINISTRATION

The Puerto Rico Reconstruction Administration continued its program during the year with major emphasis on projects of rural rehabilitation. Although obligated funds available were approximately 30 percent less than in the preceding year, there was no diminution of the Administration's efforts to help the Puerto Ricans toward a sounder economy. Substantial progress was made in soil conservation, reforestation and the construction of the Dos Bocas hydroelectric project. Guidance was given through the central service farms looking to better methods of farming and marketing. The continuation of the cattle tick eradication program promises a better supply of meat and milk so badly needed in the Island. In all of this work valuable cooperation has been extended by the Agricultural Extension Service, the Insular Department of Agriculture and Commerce, and the Federal and Insular Experiment Stations.

Through its Cooperative Division, the P. R. R. A. has maintained supervision of the various cooperatives previously financed by Government loans, and has aided in the organization of three additional small cooperatives. The production of winter vegetables for the New York market has been stimulated with good results. The cultivation of onions, previously imported to the island, and of vanilla, another source of new income, have shown encouraging progress. Loans have been made to needy farmers who had no other available source of credit for the growing of subsistence crops and the purchase of livestock and poultry.

The operations of the Lafayette sugar mill cooperative have been satisfactory. The plant constructed for the conversion of sugarcane byproducts into solvents such as butyl alcohol and acetone is now in full operation. These byproducts will not only provide income beyond that realizable under the quota restrictions applicable to raw sugar, but may be important sources of supply for elements necessary in connection with the defense program. The 12 land cooperatives, however, to which sugar lands were sold on the credit of the Government, have not been as successful as the sugar mill cooperative, and will have to be liquidated. It is planned to subdivide the lands and to sell them in relatively small parcels to experienced sugarcane growers, safeguarding the investment of the Government while at the same time realizing the fundamental objective of the project for more equitable distribution of sugar lands.

Despite its limited funds and authority under the Emergency Relief Appropriation Acts, the P. R. R. A. has made substantial contributions toward relieving the economic distress of the island. No mere palliatives can solve the basic problem of a dense and ever-increasing population struggling to wrest a livelihood from exceedingly limited resources. The unemployment situation, which still remains most serious, has been temporarily relieved to some extent by the intensified national-defense work now in progress. Possibly the recent amendment of the Fair Labor Standards Act, providing for a special committee to study and recommend minimum wages to be paid to employees in Puerto Rico, may improve the condition of that part of the population which is dependent upon commerce as distinguished from agriculture. This, however, will not solve the problem of how to create a sufficiently increased income to support nearly 2,000,000 people.

Further industrial and agricultural development of the island is imperative; for that development progressive leadership and capital for full utilization of the island's resources must be found. Only in part can this be accomplished by a program of relief spending. Nevertheless, such spending cannot be terminated unless substitutes in the way of more satisfactory remedies for permanent cure are put into immediate effect. What the P. R. R. A. has done has at least given hope to thousands of people who otherwise would have been cast into utter despair. Weakness of one part of our body politic may effect the health of the entire body; therefore whatever is done to help the inhabitants of this strategic outpost of defense, may well be considered not merely one of emergency relief, but an important element in our program of national preparedness.

THE VIRGIN ISLANDS

During the greater part of the year, there was marked unemployment in the islands. This situation was relieved in St. Thomas by the initiation of projects in connection with national defense.

The general agricultural economy of St. Croix, however, has been at a low ebb for the past 3 years due to a severe drought, which continued during 1940.

Federal funds amounting to approximately \$400,000 from appropriations made to the Work Projects Administration were made available to the Virgin Islands in 1940, for a large variety of projects. A total of \$240,000 in Public Works funds also was made available for the building of an abattoir in St. Croix, as an aid to the cattle industry, and for the construction of a public market in Charlotte Amalie.

THE VIRGIN ISLANDS CO.

Sales figures for the 1940 fiscal year are not yet available. In the fiscal year 1939, the Virgin Islands Co. sold \$75,607 worth of raw sugar, \$88,436 worth of Government House Rum, and \$14,364 worth of a special distillate.

Although the 939 growers of sugarcane in St. Croix come under the restrictive provisions of the Sugar Act of 1937, the Congress has not yet extended to them the benefit-payment provisions of the act as an offset. St. Croix growers are the only ones under the American flag

who are treated with such discrimination. In addition, St. Croix growers, unlike other American growers, are required to pay an export tax of \$6 per ton on all the raw sugar shipped to the continental United States. It is essential that remedial legislation be enacted by the Congress to overcome these discriminations. Strong efforts also are being made to secure the enactment of legislation to transfer to the government of the Virgin Islands all taxes collected under the internal revenue laws of the United States on articles imported into the United States from the Virgin Islands.

GENERAL LAND OFFICE

The facilitation of national defense and the continuation of the program for conservation of the resources of the public domain were the primary objectives of the General Land Office during the year. The chief contribution to the defense program was to make available to the War and Navy Departments the broad areas of public lands which are suitable for military and naval purposes. Withdrawals of the public lands and requests for withdrawals in connection with the national defense program during the year embraced more than 7,000,000 acres. In addition, all outstanding aviation leases and beacon light permits contain provisions under which the Secretary of War may assume full control over the lands whenever the President deems them necessary for military purposes. A total of 41,369 acres has been withdrawn for air-navigation purposes.

The food supply of the Nation is vital to national defense, and a prime factor in the food supply is potash as a fertilizer. As a result of the war, shipments of this material from Europe and elsewhere have practically ceased. To meet the emergency, over 6,000 acres of land, comprising the greater part of the dry bed of ancient Searles Lake in California, have been leased. This area is rich in potash and the supply which will be available from this source, together with other potash produced in this country, largely from land leased from the Government in California and New Mexico, should be sufficient to meet all domestic needs.

For many sections of the United States, the township plats which depict the public land surveys, including the general topography, supply the only map data available for military purposes. The rectangular system of surveys supplies a simple, concise, and definite identification of the boundaries of lands. During the year cadastral engineering activities resulted in surveys embracing 5,693,105 acres, in addition to engineering investigations and special projects. The surveys cover a total of 35,540 miles.

The change from the system of issuing permits for oil and gas prospecting on the public domain to the system of issuing leases, has been practically completed. The change was designed to aid in the conservation of oil and gas resources, to prevent speculation and to secure more adequate returns to the United States from such resources.

The management of the timber resources on the approximately 2,500,000 acres of revested Oregon and California railroad and reconveyed Coos Bay Wagon Road grant lands in Oregon was furthered by additional research, and by the inventory, classification, and estab-

lishment of improved procedures for maintaining sustained yield timber cutting.

Substantial progress was made on an inventory of the resources of the public domain, the mapping of the public-domain lands, the classification of lands, and the assembly and analysis of information concerning the economic resources of Alaska.

In order to secure increased benefits to the people from the use of the public lands, regulations were issued providing for an annual rental of \$5 per mile or fraction thereof, for rights-of-way over the public lands for telegraph and telephone lines, tramroads, oil and gas pipe lines, water pipe lines, ditches, and canals. A charge of \$5 per acre or fraction thereof per annum also was imposed for the use of public lands for reservoirs, water plants, well sites, and other like structures.

GRAZING SERVICE

The impact of events abroad have brought to American citizens a deeper realization of the need for range conservation in the national preparedness program. The vital importance of a continuous, adequate supply of food and clothing, based on the forage resources of the western ranges, became more clearly recognized during the year. Conservation of the Federal grazing lands of the West, from which is derived a large part of the beef, mutton, wool, and mohair essential to our daily lives, became an integral part of our national-defense program.

The sixth year of grazing district administration by the Grazing Service witnessed sound advancement in the improvement and orderly use of the western ranges. In response to popular demand, both locally and nationally, the program was enlarged in scope as well as in area. Efforts were directed toward coordinated use and planning for the protection of the resources and the benefit of the people who are dependent upon grazing.

Aligned with programs for the protection and improvement of the the range was a general plan for the development of a correlated land pattern in the districts.

Many of the perplexing problems involved in a mixed ownership of interdependent land amounting to more than 250,000,000 acres were ironed out. Cooperation with States, counties, railroad companies, and individual landowners reached a new high during the year. An amendment to the Taylor Grazing Act on July 14, 1939 (Public, 173, 76th Cong.) welded further the mutual cooperative efforts of the stockmen and the administration. Advisory boards, elected by the range users, functioned with greater interest and efficiency than theretofore. During the past year these boards were brought more prominently into the planning end of range administration. This system of local representation encouraged direct conservation practices by the licensees and permittees.

Security in land tenure is the biggest problem facing the livestockman of the West today. If he is to plan and manage his business successfully he cannot be constantly confronted with the hazard of competitive, unstable land policies. The stabilization of the grazing district land pattern will go far toward meeting the stockman's need.

Three additional grazing districts were established during the year, increasing the number to 53 and the acreage of Federal range area to 140,847,900. Grazing licenses and permits were issued to 20,609 stockmen owning 11,930,964 livestock.

Mutual cooperative efforts between the stockmen, the Service, and numerous other citizens brought about the largest possible amount of citizenship participation in the development and use of the range resources. Studies and plans were directed toward possible emergency needs for greater facility in the production and distribution of essential livestock products. It is a pleasure to report that the range country is now in a better position than ever before to meet present and future emergencies. Production can be kept on a continuing basis without undue injury to the land or the forage. With the help of 555 district advisers and the cooperation of all of the range users, the livestock business can be maintained on a high productive level consistent with wise use of the required resources.

In cooperation with the Civilian Conservation Corps, the Grazing Service operated 89 C. C. C. camps engaged in range improvement work in the Federal grazing districts. Activities ranged from exterminating insects and rodents to fighting range fires. Water development continued as the outstanding need in the range conservation work. Flood control, erosion control, range revegetation, and fence construction, trail building, eradication of poisonous plants, rodents, and predatory animals, all contributed to a better range and a healthier livestock industry.

Work on the ranges has developed a reservoir of men and equipment useful for any defense emergency. Should the need arise, equipment such as trucks, tractors, and concrete mixers, manned by skilled operators, could be mobilized and used locally for building and repairing roads, dams, air navigation sites, or other facilities. In addition, maps, showing roads, towns, and general topography are available for both civilian and military use. Base maps of this nature already completed cover 535,680 square miles in 10 western States. Developed primarily for use in range administration, these maps are useful in the defense program, especially in connection with air and land maneuvers and border patrols.

Within the boundaries of grazing districts are many known undeveloped mineral deposits and a number of mines producing essential war minerals. Men and equipment in the Grazing Service could be thrown into active service to facilitate the production and transportation of such raw materials. In the event of emergency, Grazing Service personnel is instantly available for patrol duty to guard roads, bridges, reservoirs, and other structures as well as water supplies in outlying sections of the West. In keeping with the national preparedness program, range conservation is one of many important "behind-the-lines" activities of today.

DIRECTOR OF FORESTS

It is also a matter of gratification to be able to report that the forest resources under the jurisdiction of the Department of the Interior are so strategically situated and so well developed as to be able to make substantial contributions to the national defense. These resources were under development during the World War of 1917

and contributed in full measure to our efforts at that time. During the existing emergency, we are in a position to furnish large volumes of essential forest products. The administrative units throughout the service are being so organized as to meet any increase in demand which may develop.

As is well known, forest administration has been one of the principal functions of the Department of the Interior since it was established in 1849. The Department was first among the executive establishments vested with administrative responsibilities in forestry. Long before the creation of the first National Forest reserve in 1891 and the granting of authority to administer the National Forest reserves in 1897, the Department put forth special efforts through its various bureaus and offices to protect and promote the interests of the Federal Government in the forests of the public domain and on other Federal lands.

Because of the highly diversified conditions which characterize the public domain, the National Parks, and the Indian lands, the Department of the Interior carries on a wider range of forestry functions and activities than any other Federal Department. It is significant that today, almost two-thirds of the area of all Federal lands in the United States proper is under the jurisdiction of the Department of the Interior. If Alaska is included, then Interior's jurisdiction extends over almost three-fourths of all Federal lands.

Owing to these large holdings, the activities of the Department in the field of conservation are of material importance in the determination of the Nation's timber budget and the concomitant influence of timber and forage growth. The wide problems of public policy in regard to forestry are being studied by a Joint Congressional Committee on Forestry. As an aid to this committee, the Director of Forests prepared a detailed report on the conservation policies of the Department. The report recommended that Indian forest reserves be established and operated on a cooperative sustained-yield forest management. It also urged the bringing under sustained-yield management of the unreserved public domain lands intermingled with and lying adjacent to the revested Oregon and California grant lands. It further recommended that legislation be enacted authorizing the sale of forest products from areas within grazing districts under appropriate rules and regulations. It found, too, that funds are needed for listing the scattered, unreserved public domain lands not included in grazing districts, and for surveying their resources.

In addition to preparing the extensive report for the Joint Committee on Forestry, the Director of Forests prosecuted an extensive program of forestry activity during the year. Marked progress was made in perfecting the organization of the O and C grant lands. A large volume of Indian forestry business was handled, and two important Indian timber damage suits were brought to a successful conclusion. Extensive assistance was rendered to the Land Committee of the National Resources Planning Board. Advisory services were given in a large number of cases and help was forthcoming on problems of the various agencies of the Department having administrative responsibility in forest conservation.

DIVISION OF INVESTIGATION

The Division of Investigations made substantial contributions to the defense program during the past fiscal year. The War Department was assisted in its program of national defense through the examination and classification of lands withdrawn for artillery ranges, aircraft bombing ranges, and other defense purposes, and in one case the Division assisted the Department of Justice in obtaining a restraining order to prevent mineral claimants from performing work that was interfering with the use of the land as an airplane landing field for Army bombers. This cooperative work by the Division is continuing and will result in the cancellation of additional thousands of invalid mining claims, thus helping the War Department to protect itself from unjust claims for damages by persons attempting to hold title to the lands.

Information concerning the status of public lands, gathered through the past several years in investigations for the Grazing Service, is being made available to the Army Air Corps for the purpose of enabling it to arrive at a decision as to what lands might be desirable for inclusion within certain proposed bombing and gunnery areas.

Land classification and appraisal work by the Division has produced information of value to the Geological Survey in the location of mineral deposits vital to the national defense program.

PETROLEUM CONSERVATION DIVISION

Conservation of our petroleum resources continued to gain importance during the year as the outlines of our defense program were formulated. The mechanical implements of defense which we propose to increase so drastically are all dependent upon gasoline and oil for their operation, and as a consequence, heavy new demands face our petroleum industry. Warships, tanks, prime movers, mechanized units, and aircraft all need gasoline and oil. The large additions to the Navy, the mechanization of the Army and the huge increase in our air force make an adequate supply of gasoline and oil more imperative than ever before.

The Petroleum Conservation Division has no authority to enforce Federal regulation of the oil industry and has never attempted to do so. But within its sharply limited field of action it has been vigorous in its efforts to produce sensible conservation of our vital supplies of petroleum. During the year it continued to aid in the administration of the Connally law and cooperated with the Interstate Oil Compact Commission, as well as with the oil and gas producing States.

The Division was active in the investigation of alleged violations of the Connally law. Its year's activities brought the total number of cases that it carried to prosecution in the courts to 125. Out of these, it has won 121 convictions. Fines assessed and bonds forfeited since enforcement was started totaled \$231,100, of which \$50,000 were assessed during the fiscal year.

Activities in the East Texas field continued at a fast pace. The Federal Tender Board reported a successful year with more than 98 percent of the production being accounted for to the Board. The East Texas Board reported that, for the first time, there was a diminu-

tion in the number of new wells drilled in that field. Fewer wells were drilled during the year than in any other year since the field was opened.

During the year, the Division cooperated with numerous Government agencies working on oil problems. Its technical aid and expert assistance were requested on several occasions and its trained personnel were called upon to handle many defense problems relating to petroleum.

The experience of the Division in dealing with the industry and with State bodies governing petroleum production continued to show the desirability of some form of Federal regulation to assure that there should be no unnecessary wastage in the extraction of this vital—and definitely limited—resource.

BITUMINOUS COAL DIVISION

The complex problems of the bituminous coal industry became a matter of concern for the Department this year with the establishment of the Bituminous Coal Division. In accordance with your Reorganization Plan, the Bituminous Coal Division took over the functions of the old National Bituminous Coal Commission and proceeded at once with the work of establishing minimum prices and marketing rules and regulations for the industry.

In less than 4 weeks after the transfer of functions, the new Division reopened the hearings on prices which had been started by the old Commission. Six months of continuous hearings were required to allow nearly 400 parties to make their appearance. Working under pressure, the Division, by the end of the year, was in sight of its goal—the promulgation of prices and rules. These were put into effect 90 days after the close of the year. By firm application, and by strenuous and devoted effort, the personnel of the Division were able promptly to accomplish the task.

As prices did not become effective until after the close of the year, I cannot report upon experience in marketing coal under them. It is not possible, therefore, to forecast with certainty their effect upon the conditions which the Coal Act seeks to alleviate. The fact that we were able to make such outstanding progress with a vexatious problem, however, generated considerable optimism in the coal industry.

The objective of the Bituminous Coal Division, of course, is to bring a generally demoralized industry up to a par with American industry in general, without inflicting undue injury upon consumers. The problems that the industry faces are many and involved. Price demoralization is only one. The competition of other fuels and of transportation are others. The welfare of the coal industry is of paramount importance to the national defense. It furnishes about 85 percent of all fuels and energy consumed by railroads, 49 percent of that used by electric utilities, and about 75 percent of that used by general manufacturing plants. Bituminous coal is a source of basic raw material for hundreds of important commodities.

The method by which we are seeking to restore some order into the bituminous coal structure is through market stabilization. I feel that we are at least on the track and moving. I do not for a moment

consider that what we have accomplished represents perfection, but I am certain that we have established a mechanism, which by changes and refinement, can attain wholesome results.

In setting minimum prices, the Division has not attempted, nor was it instructed, to remake the coal industry, or to set prices according to its own conception of efficiency or in keeping with a planned economy. The prices were designed to yield the industry an income equal, as nearly as possible, to its average cost, and at the same time to preserve for the coal producers such "fair" competitive opportunities to sell their coal as they enjoyed under unregulated competition. However, the prices were formulated with the view firmly in mind that the Coal Act necessarily eliminates the "competitive opportunity" of producers to attempt to make inroads on markets by price cutting which results in lowering the industry's income below its average cost. The law also eliminates the "competitive opportunity" to make sales by means of dumping, the sale of "distress coal," manipulations resulting in discriminations between individual consumers in the same market, and all the other chaotic forces which were present in bituminous coal markets under free and open competition.

OFFICE OF THE SOLICITOR

During the year, the Office of the Solicitor rendered valuable assistance in the solution of problems having a vital bearing upon national defense. The conservation, protection, development, and utilization of petroleum and other mineral resources; the harnessing of water power for the production of hydroelectric energy; the maintenance of the livestock supply without which no army could long continue to function, and the contribution of the public lands to the upbuilding of a strong national economy—these are all activities which would be almost impossible without the competent legal services rendered by this Office. An analysis of the work in the immediate office of the Solicitor indicates that its volume was approximately 20 percent greater than during the preceding fiscal year.

The famous Section 36 Elk Hills oil field case—one of the most important and prolonged public-land controversies ever to come before this Department or the courts—was brought to a successful conclusion during the year. Affirmance of the decision of the District Court for the Southern District of California by the Circuit Court of Appeals for the Ninth Circuit, and the denial of a vigorously pressed petition for certiorari by the Supreme Court of the United States resulted in the quieting of the Government's title to a square mile of valuable oil lands in the geologic center of a naval petroleum reserve. This case also resulted in the recovery of approximately \$7,137,000 from the Standard Oil Co. of California as damages for the oil and gas extracted from that section while adversely held under claim of title.

The decision of the Solicitor in a similar controversy involving section 16 in the Elk Hills field determined another square mile of oil lands, probably worth several million dollars, to be property of the United States.

Another public-land controversy of scarcely less importance, in which a favorable decision was rendered by the Supreme Court dur-

ing the year was the case of *United States v. City and County of San Francisco*, involving the distribution of electric power from the Hetch Hetchy project in California. The decision of the Supreme Court upheld the constitutionality of the provisions of the Raker Act of December 19, 1913, requiring municipal distribution of electric energy produced through the use of lands and rights-of-way granted San Francisco under that act, as a valid exercise of the power of the Congress to control the disposition of the public domain. The Court sustained the contention of the Department that the arrangements for the distribution of such energy made by San Francisco were not in conformity with these provisions.

PERSONNEL AND MANAGEMENT

The Division of Personnel Supervision and Management reports that at the close of June 30, 1940, there were 48,947 employees in the Department and that the total expenditure for the fiscal year for salaries and wages was \$72,684,666. Improvements and techniques in personnel administration have been introduced to keep pace with the growing needs of the Department. One innovation worthy of special mention is the setting up of a central stenographic training center, into which new stenographers pass for a two weeks' training course in the Department's correspondence style and procedure. Another is the preparation of a stenographers' handbook as a textbook guide for all stenographers in the Department. Thus, the bureaus and offices have been relieved, to a great extent, of the initial training of these employees.

The personnel actions handled during the year by the Division totaled 29,568; 12,849 applications for employment were received and reviewed; 1,536 applicants were interviewed. In recruiting employees for noncivil service positions, primarily in connection with the Civilian Conservation Corps activities, the Division operates as a miniature civil service commission in rating applicants, establishing registers, and certifying eligibles. In this connection, 2,137 certificates of eligibles, containing 4,549 names, were issued by the Division during the year.

The average amount of annual leave used per person in the District of Columbia was 24 days; average sick leave, 8 days. The records show that during the year 92 employees retired because of age and optional age, and 76 on account of disability.

CONCLUSION

This outline of conservation in progress indicates that our people are finally alert to the nature of the problem we face in the administration of our resources. They have begun to weigh the social consequences of individual action when it involves a looting of the heritage that we have received from Nature.

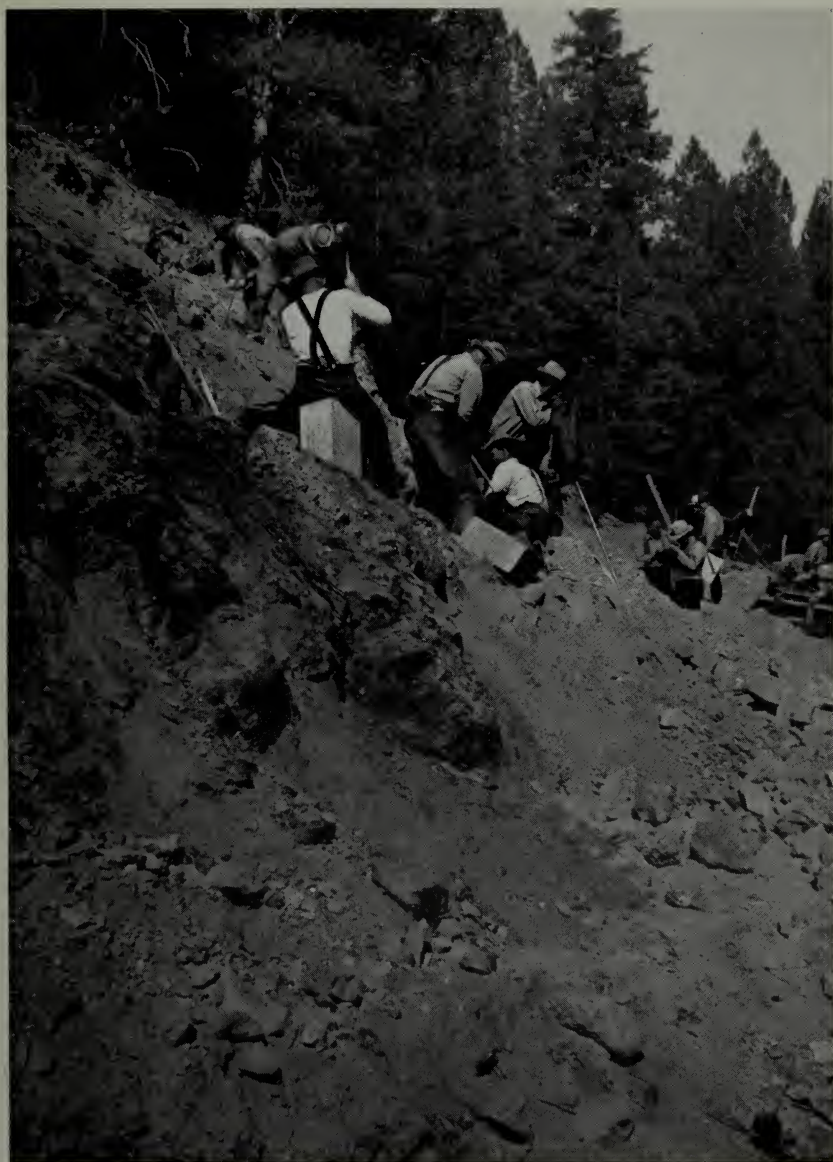
But much still remains to be done. In the coming months, as the pace of defense quickens and short cuts in the form of resources raids are threatened, our conservation principles will be put to the test. The story of what is involved for this Department is told in the full reports of our Bureaus and Offices which I herewith transmit for your consideration.

One thing is clear. The wisdom of the policies that we have followed for the last 7 years is now bearing fruit. We are rich in resources, because we have put our house in order. Our natural wealth forms the sinews and muscles of our defense machinery. We will continue to administer prudently our resources for present use, and for defense when we must, and guard them for the future, always.

Very respectfully,

Harold L. Ickes

Secretary of the Interior.



DIGGING IN FOR DEFENSE.

Bureau of Mines experts drill blast holes by hand in study of strategic mineral deposits in Idaho.



MINE SCIENTISTS AID INDUSTRY.

Upper: Bureau of Mines men demonstrate how coal-dust explosions in mines can be prevented by rock dusting.

Lower: Eyes that see through rocks. Bureau of Mines spectograph operator can determine in 30 minutes the mineral contents of rocks requiring three days of analysis by chemists.

BUREAU OF MINES

R. R. Sayers, *Director*

THE fiscal year 1940 was especially significant to the Bureau of Mines because it marked completion of three decades of service to American mining. The Bureau's organic acts (36 Stat. 369 and 37 Stat. 681) authorized it to promote safety in the mineral industries, to conserve mineral resources, and to conduct investigations on the mining, preparation, and utilization of minerals. Although the Bureau now carries on a wide variety of activities and has established experiment stations and other field laboratories in a number of American mining centers, its basic program still follows closely the three fundamental lines established by Congress.

Inasmuch as any program of military preparedness depends on an unobstructed flow of minerals, the Bureau of Mines, by virtue of the duties specified in congressional acts, is in reality an important defense agency of the United States Government, a fact emphasized by many activities of the past fiscal year. Moreover, the Bureau operates a plant that produces virtually the world supply of helium and in a war emergency automatically supervises the licensing of explosives for nonmilitary use.

An outstanding example of the conversion of statistical data to defense purposes was utilization by the Advisory Commission to the Council of National Defense of the Bureau's long-standing files on sources, production, consumption, and stocks of strategic minerals. In fact, the Commission's mineral consultant established headquarters in the Bureau of Mines and made its files the basis for setting up his own records. Statistical information supplied by the Bureau also aided the Army and Navy Munitions Board in its stock-piling program; other data were most valuable to the National Resources Planning Board. The embargo on steel scrap proposed by the Advisory Commission threw the Bureau's improved scrap-metal canvasses into sharp focus. Data were compiled for defense agencies on abrasive diamonds, asbestos, graphite, quartz crystals, mica, iodine, and other nonmetallic commodities essential to a military program. The Bureau's foreign mineral specialist completed surveys on the mineral resources, production, and trade of Argentina, Bolivia, Chile, and Peru and assisted procurement boards to find new sources of

supply for materials cut off by the European war, including tin, tungsten, chromite, antimony, mica, and the ever-important manganese.

The so-called Strategic Minerals Act authorized the Bureau to examine deposits that might be a source of strategic minerals in a war emergency. Ten such deposits were tested by surface trenching, pitting, and diamond drilling, and 163 others inspected more briefly. Results indicate significant quantities of strategic minerals in 3 of the deposits and the possibility that in an emergency the country could be self-sufficient as regards antimony and mercury. Bureau of Mines metallurgical laboratories completed 11,718 analyses and other tests of samples shipped from the field.

Other Bureau of Mines activities of the past year that concerned the national defense program were: Conservation of high-rank coals by testing the combustion and carbonizing properties of low-rank coals; production of benzol, toluol, and xylol (necessary for explosives) as byproducts of the coking of coal; hydrogenation tests of American coals to find their value as a source of motor fuel; metallurgical investigations of the production of electrolytic manganese and magnesium metal; expansion of information on demolition explosives; survey of aviation gasoline; substitution of American non-metallic minerals for a wide variety of commodities imported from abroad; and emphasis on the instruction of first-aid teachers who could train civilians in an emergency.

The Bureau of Mines, believing, with its first Director, that "True conservation is a wiser and more efficient use of our natural resources," endeavors to conserve America's minerals by improving methods of mining, preparing, and utilizing them. No activities of the Bureau exemplify this more clearly than its work on solid and liquid fuels. During the past year especial efforts were devoted to ascertaining the coking properties of America's low-rank coals to establish the extent to which they can replace steam and coking coals of higher rank and dwindling supply. The Bureau also tested coals from seven States to find how readily they liquefy to produce motor fuel and useful byproducts of the hydrogenation process. Meanwhile, the Bureau's petroleum engineers studied energy relationships to find how the greatest amount of petroleum can be produced with the least waste of natural energy, oil, and gas.

Correlative economic studies on fuel included a continuing survey of coal, petroleum, natural gas, and electricity available for consumption in the United States and Canada; summaries of the competitive-fuel situation in the anthracite-consuming States; reports on the substitution of fuel briquets and packaged fuel made from fine coal for lump coal in domestic heating; monthly forecasts of the demand

for petroleum; and collection of data on the consumption of fuel oil, range oil, and kerosene.

Establishment of headquarters for the Bureau's metallurgical work at Salt Lake City made laboratory and pilot-plant facilities readily accessible to mining industries of the West. Much attention is being focused upon methods of recovering important metals from low-grade or off-grade ores. Laboratory tests of an electrothermal process for producing magnesium metal from magnesite have been encouraging. Preliminary investigations of the characteristics of manganese made by the Bureau of Mines electrolytic method were followed by tests of this material in a series of manganese alloys. Economic studies of metals endeavor to promote orderly development of domestic resources by providing data on production, consumption, and stocks of virgin material as well as reporting the results of canvasses on consumption and stocks of ferrous and nonferrous scrap.

At several experiment stations the Bureau is applying ore-dressing methods to domestic nonmetallic minerals to produce satisfactory grades of ingredients for a wide variety of commodities, formerly supplied from abroad. Almost any type of clay-working properties can be developed from domestic materials. It is of especial interest that North Carolina alaskite has been found to be a potential substitute for British Cornwall stone and that domestic olivine can be used instead of imported magnesite in refractories. Special economic data were compiled on nonmetallic minerals that must now be obtained from domestic sources.

The 1940 edition of Minerals Yearbook, the Bureau's annual review of sources, production, distribution, and stocks of minerals comprises 69 chapters, about two-thirds of which have been published as preprints.

No annual report of the Bureau of Mines would be complete without a brief summary, at least, of special services performed upon request for Federal and State agencies and the mineral industries. This year added burdens were entailed by work requisitioned in connection with the defense emergency.

An unusual number of requests concerned petroleum. Bureau specialists prepared comprehensive reports on petroleum production and manufacture for a subcommittee of the House Committee on Interstate and Foreign Commerce and for the National Resources Planning Board. For the Biological Survey, they studied the effects of an uncontrolled oil well on a Texas waterfowl refuge and, for the War Department, the results of building a dam that would inundate Oklahoma oil-bearing lands. Illinois, Kansas, and Oklahoma asked for help in disposing of oil-field brines.

Power-plant and fuel-efficiency surveys were made for Federal establishments and the District of Columbia Government, acceptance tests of new equipment were conducted, and shipments of coal for Government use inspected. Twenty pieces of electrical equipment were tested for the Navy. Small mine owners were told how to operate their properties safely and economically. New flow sheets that would improve the recovery and quality of the products were designed for ore-dressing establishments. Explosives were tested for safety at the request of State mine inspectors, mine operators, and manufacturers. In cooperation with the Tennessee Valley Authority, work was continued on the electric firing of a wide range of ceramics, including brick, china, and sanitary wares.

Important statistical information was supplied by Bureau of Mines economists. Monthly canvasses to show the domestic situation regarding five strategic minerals were undertaken at the urgent request of the Army and Navy Munitions Board, and only lack of funds and personnel prevented expansion of the series to cover all minerals on the strategic and critical lists. Services to the secondary-metals industries were expanded at their request. The last 5 reports of a series of 14 on mineral technology and output per man, prepared in cooperation with the Work Projects Administration, were completed; these discussed petroleum, bituminous-coal mechanization, gold placers, iron ore, and rock drilling. Inquiries from trade organizations and producers on the export coal trade were handled promptly. Lists of producers and buyers of minerals were furnished on request.

The Bureau of Mines endeavors to promote safety by accident prevention and improvement of working conditions and has issued the usual series of reports on mine accidents. Because falls of rock and coal cause a large proportion of all deaths in mines the Bureau has made searching tests to establish methods of detecting subaudible sound waves that precede collapse of mine pillars. Dust-prevention studies and complementary investigations of respiratory devices to be worn in dusty atmospheres are continuing problems of the Bureau. During the year X-ray methods for determining free silica were improved, and the safe handling of explosive dusts that may be used for fuel was studied.

The Bureau has also suggested the use of helium in cyclopropane anesthesia as a means of avoiding gas explosions in operating rooms and administration of helium-oxygen mixtures to avoid "ear-block" among caisson workers.

Ventilation is tremendously important to the efficiency of all workers. In 1940 the Bureau not only considered ways of determining and guarding against harmful dusts, as mentioned above, but checked the

efficiency of mine ventilation by analyzing 1,400 samples of mine air and gas.

Mechanized coal mining is being studied with special emphasis on safe operation of equipment. Permissibility tests of electrical apparatus for use in mechanized mines provide mine owners with rigid standards for safe operation.

To establish more definitely the cause of mine explosions, the Bureau during 1940 made 1,619 gallery tests to determine whether samples of explosives would ignite explosive air-gas mixtures, conducted 1,050 explosives-control tests, and studied the processes by which explosives ignite firedamp.

The Bureau's safety and health personnel and equipment continued to be on call in emergencies and were in their usual demand. At the request of the West Virginia Department of Mines a special course in rescue training was conducted for 481 applicants for coal-mine foremen's certificates. Bureau of Mines safety instructors completed the 100-percent first-aid training asked by 205 mineral establishments, assisted at 60 first-aid meets, and attended 790 safety meetings. During 1940, 93,878 persons were instructed in first aid and since 1910 first-aid and rescue courses totaling 1,361,465 have been given, including 986,467 to members of the coal industry alone.

Perhaps the most widely known features of Bureau of Mines safety work are its rescue and recovery operations after mine disasters, especially where lives are at stake. During 1940 Bureau engineers were asked to give assistance at or to investigate 18 mine explosions, 28 mine fires, and 78 miscellaneous accidents. Three of the explosions were major disasters, costing 191 lives in all; these catastrophes were all the more shocking because they followed a fiscal year in which not 1 major disaster occurred. If the mines in which these 3 disasters took place had fully complied with the Bureau's recommendations on safety in operation, especially rock dusting, the loss of life would have been materially reduced.

FUTURE WORK

The preceding summary of Bureau of Mines activities for the past fiscal year proves that its threefold program of safety, conservation, and research has almost unlimited ramifications. During the coming year the Bureau, in addition to continuing or extending much of the work listed above, plans to undertake the following new projects, as far as its personnel and resources permit:

In the field of metallurgy a comprehensive program for the beneficiation of manganese ores has been planned with the objective of recover-

ing manganese from an entire ore body, including the low-grade material; work on the electrothermal reduction and distillation process for the production of metallic magnesium from magnesite will be continued and expanded, and emphasis will be placed upon the development of lightweight, corrosion-resistant magnesium alloys of adequate stiffness and strength and upon further studies of manganese alloys; electric-furnace smelting of complex ores; and tests of large-scale sonic flocculators for handling smelter dust and fume. Investigations of American resources of nonmetallic minerals and their beneficiation will endeavor to render the Nation more independent of foreign supplies of fluorspar, feldspar, talc, magnesite, clays, and graphite.

In addition to determining the physical and chemical properties of American coals with reference to their most efficient utilization as fuels and the production of gas, coke, and byproducts, it is hoped that attention can be given to the mining, preparation, and utilization of anthracite.

Economic studies will be adapted to current demands. It is desirable to improve studies of the competitive-fuel situation and to expand investigations of byproduct recovery from coking plants and the supply of and demand for byproducts of coal processing. If opportunity offers, the detailed record of production of metals in Western States by districts and mines will be completed, accident data enlarged to include more detailed statistics by causes, and accident statistics gathered on the petroleum and sand and gravel industries.

Orderly development of mineral resources would also be promoted if data were kept current on sources, production, consumption, and stocks of important minerals. This procedure will be followed during the year with regard to as many strategic and critical minerals as possible.

Expansion of Bureau of Mines work in Latin America will not only help to foster the mineral industries of these sister republics but doubtless will open new sources of supply for the United States.

In view of the fact that many new workers will be needed in industries producing supplies needed by the defense program, especial attention will be devoted to making working conditions safe and hygienic. The past year's black record as regards coal-mine explosions prompts the inevitable conclusion that training in accident prevention must be stressed if the mining industries are to retain the improvement they have shown during the first 30 years of the Bureau of Mines.

REVIEW OF THE YEAR'S WORK

The numerous and varied activities of the Bureau of Mines during the fiscal year 1940, though supervised from Washington by offices of the Technologic, Economics and Statistics, Health and Safety, and Administrative Branches, were conducted largely in the principal mining districts of the country and at the 14 experiment stations in the following list: Bartlesville, Okla.; Berkeley, Calif.; Boulder City, Nev.; College Park, Md.; Laramie, Wyo.; Minneapolis, Minn.; Norris, Tenn.; Pittsburgh, Pa.; Reno, Nev.; Rolla, Mo.; Salt Lake City, Utah; Seattle, Wash.; Tucson, Ariz.; and Tuscaloosa, Ala. Important features of the year's work have been summarized below by branches and the divisions that comprise them.

TECHNOLOGIC BRANCH

The function of the Technologic Branch is to conduct engineering and scientific research in the interest of the mineral industries. The branch comprises six divisions—Coal, Mining, Metallurgical, Petroleum and Natural Gas, Nonmetals, and Explosives—and the office of the principal mineralogist. The branch also has charge of the cooperative programs between the Bureau of Mines and corresponding Government organizations in several foreign countries.

Coal Division

Investigations of the Coal Division emphasized conservation of the Nation's best coals by improving the utility of those of lower rank. One study of this type involved tests of the coking characteristics of coals that have not hitherto been employed in byproduct ovens, including two from Washington State that may be used for making coke if an iron and steel industry should be established in the Pacific Northwest. In an effort to promote the use of coals whose ash melts at low temperature (which makes them undesirable for some purposes because they form troublesome clinker), a thorough investigation was made of the properties of ash; it has been found that such coals can be burned economically in large powdered-coal furnaces from which ash is removed in molten condition. Tests continued in Government power plants to develop stokers suitable for burning subbituminous coal and lignite in localities where these fuels are cheaper than higher-rank coals. Especial attention also was devoted to low-rank coals in the course of research on hydrogenation of coal to produce the liquid fuels that doubtless will be substituted for gasoline and oil derived from petroleum when resources of the latter become depleted.

Fuel-economy service.—The fuel-economy service section made power-plant surveys, fuel-efficiency tests, and acceptance tests of new equipment, thereby advising Federal agencies how to select and burn fuel efficiently.

Work on boiler feed-water conditioning increased more than 30 percent over that in the previous year; in consequence, efficiency was improved, maintenance cost reduced, and safety increased. Placing low-cost water-conditioning chemicals on the Government general schedule of supplies permitted savings where expensive "mystery" compounds have been used. Smoke-abatement research was continued.

Coal analyses and fuel inspection.—To maintain the quality of coal purchased for Government use, shipments are inspected constantly and samples collected for analysis. During 1940 more than 13,000 samples were received and analyzed in the various coal-analysis laboratories of the Bureau. Coal-sampling trucks visited more than 300 mines in 14 States for inspection of coal as it was loaded on railroad cars.

Use of fuels.—Recent increases in the size of steam generators, furnaces, and kilns and consequently increased rates of burning have made the properties of ash—often the predominant factor in limiting the capacity of equipment—important subjects of research. A new apparatus has been developed for accurate measurement of the absolute viscosity and density of coal-ash slags at various temperatures and in controlled atmospheres. Study of the relationships between composition, liquid temperature, viscosity, density, and other properties of coal-ash slags indicates that ultimately it may be possible to predict the viscosity-temperature curve of coal ash from its chemical analyses.

Carbonization of coal.—The carbonizing properties of five coals were investigated, and the coke, gas, tar, and oil produced were studied with regard to the chemical and petrographic composition of the coals. These tests indicate the maximum probable yield of such byproducts as toluol, benzol, and xylol from various coals. Moreover, they are important guides when untried coals are substituted in the byproduct-coking process. Low-volatile coals from the Pocahontas No. 3 bed and Pocahontas No. 4 bed, blended with three different high-volatile coals, were equally effective in increasing the strength of coke.

Tests of a coal-carbonizing power plant using subbituminous coal were completed.

Subbituminous coal and lignite.—Friability, slacking characteristics, and carbonizing properties of certain subbituminous coals of

the Denver region were determined and the results applied in research on their storage and use.

In cooperation with the University of North Dakota, large-scale laboratory tests of the use of high-pressure steam to remove moisture from lignite were made. The resultant increase in heating value justifies application of the process to the drying of lignite if it is subject to a freight rate of \$1.50 a ton or more. The process can be applied to small sizes of coal more advantageously than to large sizes.

Hydrogenation of coal.—Coals from Alabama, Indiana, Montana, North Dakota, Utah, West Virginia, and Wyoming were tested in the continuous hydrogenation plant to determine how readily they liquefy to produce gasoline and oil under industrial operating conditions.

The survey of the effect of rank and type of coal on its hydrogenation characteristics was continued. Coals gradually become more resistant to liquefaction by hydrogenation as their carbon content increases, and there is no sharp boundary between coals that give a high yield of oil and those that give a poor yield. The low-rank coals, although easily hydrogenated, appear to be more sensitive to operating conditions.

Experimental coal mine.—Tests to check results reported from abroad showed that finely pulverized salt is two to five times as effective as ground limestone in preventing the propagation of coal-dust explosions. However, salt cheap enough to be used in the necessary quantities absorbs much water from damp mine atmospheres and moreover is likely to cause rapid corrosion of metals. For these reasons, salt cannot be recommended as a substitute for stone dusts, in spite of its effectiveness.

An extended investigation of dusts prepared from coal tar, water-gas tar, and petroleum pitches that now are or may in future be pulverized for use as fuel showed that they are decidedly more inflammable and explosive than is pulverized high-volatile coal dust. Explosions of pitch dust in industry can, however, be forestalled by rigid adherence to the safety rules developed to cover the handling of pulverized coal.

Conclusions and recommendations.—The resources of the Coal Division barely permit it to keep pace with current demands. A defense emergency requiring greatly increased use of coal and its products would quickly increase the demand for investigations of certain phases of the use of coal, especially the manufacture of metallurgical coke and the substitution of poorer coals in less vital industries to release high-grade fuels for key activities. The present

research program of the Bureau, directed toward the most efficient utilization of the cheaper and more abundant varieties of coal, should be augmented in order to extend the life of the relatively limited resources of high-grade steam and coking coals. Provision also should be made for research on the mining, preparation, and utilization of anthracite.

Mining Division

During 1940 the work on certain problems concerning the mining and milling of metalliferous ores was recessed to permit assignment of mining engineers of the permanent staff of the Mining Division to the investigation of domestic deposits of strategic minerals, as authorized by Public, 117, Seventy-sixth Congress, first session. Plans had been formulated so carefully that it was possible to initiate exploration projects as soon as funds were appropriated; to complete the first year's projected program for sampling 10 deposits, involving surface trenching, test pitting, and diamond drilling; and to examine 163 additional deposits. Three deposits disclosed important quantities of strategic minerals, and there is reason for increased hope of self-sufficiency in an emergency as regards at least two of the seven principal minerals on the strategic list—mercury and antimony.

Progress continued in the development and application of methods for measuring pressures on rock pillars in mines; if successful, these will not only contribute materially to conservation of mineral resources by avoiding unnecessary waste but will promote safety. Other important results were attained from investigations of methods for controlling dust and noxious gases from blasting; of mine ventilation; and of the seismic effects of blasting operations upon structures.

Examination of strategic mineral deposits.—One hundred sixty-three deposits containing strategic minerals situated in 13 different States were examined and reports made concerning them. About 20 percent of the deposits chosen for examination would warrant some exploratory work and sampling if funds permitted. Those selected represented only a small proportion of the many hundreds reported and were determined on the basis of their comparative merit, measured by available data, as possible sources of appreciable quantities of strategic minerals in an emergency. The location of the 10 projects to which especial attention was given during the fiscal year 1940 and the metals sought is as follows: antimony—Yellow Pine, Idaho; chromium—Columbus, Mont., Casper, Wyo., and John Day, Oreg.; manganese—Port Angeles, Wash., and Philipsburg, Mont.; nickel—Bunkerville, Nev.; tin—Tinton, S. Dak., and Beaverhead, N. Mex.; and tungsten—Lovelock, Nev.

Metal mining and milling methods.—Investigations of methods and costs continued in nine Western States, and at the same time technical assistance was furnished, in the localities being studied, to prospectors and small-scale operators financially unable to employ competent engineers.

Metal-mining research.—Earlier laboratory investigations of sonic methods for determining pressures on rocks was followed during the past year by extensive mine tests, which give promise that such methods ultimately can be applied to practical solution of difficult problems in the recovery of ore and coal. Subaudible sound waves that precede actual failure of mine pillars have been detected by high amplification.

In the mine-scale laboratory at Mount Weather, Va., comprehensive tests on the use of stemming, blasting plugs, and wood safety primers were continued. Conclusions were not possible, but comparative results attained with several types of stemming supplied new information on the control of dust and noxious gases from blasting. Studies of dust prevention in rock drilling and tests of the comparative durability of alloy and straight carbon-drill-steel rods and detachable bits contributed new data that will be of practical use to metal-mine operators.

Nonmetal mining.—Rock-loading, haulage, and drilling tests were conducted at seven quarries. Tests using a scleroscope to measure the drillability of rocks lend hope that drillability indexes can be developed by laboratory methods.

The particle size and shape of concrete aggregates produced in current practice at 11 quarries were determined, and screening tests of products from different types of crushers were carried on to assist in reducing waste products from quarry operations. Analyses of data on seismic and mechanically induced vibrations in buildings provided an index of destructibility, and no vibrations from quarry blasting recorded in a great number of tests were as great as this index.

Coal mining.—Important phases of coal-mining practice were considered with a view to promoting improvement in methods that will conserve coal resources and promote safe operation. The current rapid increase in mechanization of mining operations has justified the Bureau in placing emphasis on problems related to underground transportation of coal and multiple-shift mechanized mining.

Mine ventilation.—A series of tests on fan-pipe ventilation was run under controlled mine conditions at Mount Weather; and new data having practical application to both metal and coal mines were obtained. Research on air-conditioning in mines was continued by both field investigations and analysis of voluminous literature. Both venti-

lation and air-conditioning are important from the conservation viewpoint, as they contribute to recovery of ore, that might otherwise be unminable, from great depths.

Electricity and machinery.—Investigation and explosion “permissibility” tests of electrical equipment resulted in approval of 38 machines as safe for use in gassy coal mines when properly installed and maintained in accordance with the standards promulgated in Bureau of Mines schedules. Cooperation with Navy Department engineers involved mechanical and explosion tests of 20 pieces of electrical equipment. Comparative tests of the explosive properties of aviation gasolines and “dope” solvents and thinners with petroleum ether were undertaken.

More than 350 persons witnessed laboratory demonstrations of means by which faulty electrical mining equipment and wiring may ignite gas-air mixtures.

Conclusions and recommendations.—The desirability of continuing the activities of the past year was demonstrated. Based upon the strategic minerals investigations of the past year it is apparent that, in the interest of preparedness, exploration and sampling projects should be greatly expanded. Increased technical field service to prospectors and small-scale mine operators is highly desirable to prevent wasteful and haphazard exploitation of mineral deposits.

Metallurgical Division

Transfer of the headquarters of the Metallurgical Division from the East to its new building in Salt Lake City, with adequate facilities and central location as regards metallurgical industries, considerably increased its opportunities for service and made possible more effective direction of the technical investigations.

Material success has attended work of the Bureau in developing processes for the recovery of strategic metals from low-grade or off-grade domestic ores. Laboratory results indicate that high-purity chromium metal can be obtained from off-grade chromite; an operating plant demonstrates that the electrolytic-manganese process can be used to produce pure manganese from low-grade ores; and experiments show that antimony, nickel, copper and platinum metals may be recovered from certain complex domestic ores by methods developed in the Metallurgical Division. Other tests show that some ferro-grade manganese concentrates can be produced by ore-dressing treatments of several low-grade ores and that most of the residual manganese can be utilized as an iron-rich product or recovered by the electrolytic process.

Metallurgical fundamentals.—In the continuing program of measurement of low-temperature specific heats and determination of the entropy of metallurgically important materials, original results were obtained on eight. A review of work in this field pertaining to inorganic substances has been prepared.

Calorimetric studies of the heat of hydration of various forms of calcium sulfate show some of the reasons for difficulties in manufacture and furnish a possible manufacturing-control method when adapted to plant conditions.

Studies of the diffusive separation of gases have been completed. These methods are especially adapted to the recovery of hydrogen from coke-oven, blast-furnace, refinery, and other gases.

Ferrous metallurgy.—A fundamental investigation indicates that ferrous sulfide exists mainly as a colloid in molten blast-furnace slag and that the sulfides of calcium and manganese are present both in the colloidal state and in solution in the silicate.

Tests of the effect of various added elements on the thermoelectric power of iron have resulted in the development of a practical method of employing this property to distinguish among different kinds of steel.

The magnetic apparatus utilized in studying slags and simple oxides has been found quite useful in investigating various alloys that experience internal changes.

The method of determining carbon in steel samples by measuring the magnetic saturation is capable of giving consistent results at high temperature, and a new apparatus for determining carbon magnetically appears to be satisfactory for control purposes.

Nonferrous metallurgy.—Several improvements in lead smelting and in sintering resulted from cooperative research. Modifications in one furnace produced a sevenfold reduction in barring requirements, and proper control of air supply in another permitted better operation and increased lead recovery in the bullion.

Tests in small laboratory equipment of an electrothermal reduction and distillation process for producing magnesium metal from magnesite have been completed, samples of refined metal produced, and data required to design a larger laboratory unit obtained. Large furnaces have been designed, equipment and supplies have been purchased, and many special parts for a large laboratory unit to test the process have been constructed.

Special analytical methods were developed, among them new methods for determining molybdenum, that have been introduced in several large commercial laboratories. The construction or continued operation of a number of precious metal milling plants has resulted from

successful solution of problems presented to the Bureau. A total of 11,718 analyses and tests were completed in conjunction with the strategic-minerals program.

Some success was achieved in the development of procedures for the flotation of oxidized copper ores.

Following preliminary investigations which proved that electrolytic manganese produced by the Bureau method would serve as the basic material for alloys with unique properties, considerable equipment was installed for the casting, forming, heat treatment, and testing of manganese alloys. Several series of manganese alloys with one or more of the following outstanding characteristics have been prepared and studied: Hardenability by heat treatment, corrosion resistance, high electrical resistance, high coefficient of expansion, high vibration-damping capacity, and suitability for high tensile strength die castings.

Refractory manganese ores from Idaho, Utah, South Dakota, Colorado, and Minnesota are being studied as to the possibility of treatment by matte smelting with sulfide ores of iron and copper.

Electrometallurgy.—Several important contributions in this field include the development of methods for the recovery of nickel, copper, and platinum metals from domestic nickel ores; for the electrolytic recovery of antimony from antimonial gold ores; for the manufacture of calcium boride; for the preparation of pure boric acid from colemanite; for the manufacture of pure calcium borate from raw colemanite ores; and for the production of high-purity electrolytic chromium from domestic chrome ores.

Electric-furnace tests show that domestic chromium ores can be smelted to produce acceptable chromium ferro-alloys.

Improvements in the Bureau's electrolytic-manganese process are constantly being made and applied to small-scale operations.

Dust settling.—In consequence of a comprehensive study of the kinetics of flocculation in the laboratory unit, it has been possible to increase the efficiency of the sound generator from 5 percent to 21 percent; it is expected to exceed 30 percent in the new generator being built for a large flocculating unit designed for performing practical tests in cooperation with two large manufacturers of dust-collecting equipment.

Ore dressing.—Successful plant installations based upon Bureau recommendations include three flotation plants now in operation in the Rosiclare (Ill.) district for the treatment of fluorspar ores and tailings and a concentration plant being constructed in the Birmingham (Ala.) district for the treatment of siliceous hematite ores by tabling differentially ground material.

Problems that have reached a successful conclusion include laboratory demonstration, followed by pilot-plant operations, showing the possibility of recovering one-third or more of the manganese as a ferro-grade product and most of the remainder as spiegel-grade material from black manganese ores of the Cuyuna range, Minn.; and pilot-plant tests of magnesite ores from Chewelah, Wash., showing that cationic flotation reagents can be used effectively to float silica and leave a high-grade magnesite.

Questions of timely interest that are receiving intensive study comprise preparation of concentrates of ferro grade from Utah, Nevada, and Idaho manganese ores.

Conclusions and recommendations.—Adoption by the industry of Bureau of Mines ore-dressing flow sheets and analytical procedures and development of many promising processes for the recovery of strategic metals from domestic ores demonstrate the usefulness of the current work of the Metallurgical Division.

Important projects that await additional facilities for their completion include pilot-plant investigation of the production of important strategic metals especially manganese and chromium; research on substitutes for tin; the development of light-weight, corrosion-resistant magnesium alloys with suitable stiffness and adequate strength; the study of electric-furnace smelting of complex ores; and the construction and testing of large-scale sonic flocculators.

Petroleum and Natural-Gas Division

The Petroleum and Natural-Gas Division devoted a large proportion of its personnel and funds during the year to the preparation of reports requested by other Federal agencies and consultant service to the Government. Two reports—one on petroleum production practices and the other on manufacture and use of petroleum products—were compiled for the Subcommittee on Petroleum Investigation of the House Committee on Interstate and Foreign Commerce. The authors brought up to date similar reports prepared for the same subcommittee in 1934. The index of the entire 2,170 printed pages of hearings before the subcommittee also was prepared by the division.

The history and trends of technologic developments in the petroleum industry were treated in four manuscripts written by the division for the National Resources Planning Board, and departmental reports were prepared on problems relating to national defense and conservation. Consulting services to other bureaus are exemplified by a study made for the Biological Survey of the cause and effect

of loss of control of an oil well drilled on a waterfowl refuge in Texas and technical information supplied to Army engineers concerning effects on petroleum operations of the construction of a dam and resulting inundation of oil-bearing lands in Oklahoma.

Production of petroleum and natural gas.—Energy relationships in oil and gas fields were studied to facilitate production of the greatest quantity of oil with the least expenditure of naturally occurring energy and minimum waste of oil and gas. Subsurface and surface samples of oil and gas mixtures were collected from flow systems of wells and analyzed; field tests were made with the Bureau of Mines-American Petroleum Institute pressure core barrel, and the operation of that instrument was improved; laboratory determinations of characteristics of hydrocarbon mixtures were continued; and studies were made of one of the older Oklahoma fields that helped to explain why many redrilling campaigns in similar areas have been successful.

Data on reservoir conditions in the Lance Creek oil field and in Naval Petroleum Reserve No. 3 were obtained with the aid of instruments and laboratory equipment of the Petroleum Experiment Station at Laramie, Wyo., for measuring temperatures and pressures in wells and for collecting and analyzing subsurface oil samples taken under pressure. Study of the important problem of well spacing was continued, and a review of Cutler's rule of well spacing was published. Methods of estimating oil and gas reserves in both sandstone and limestone fields were developed further, and a report was issued on reservoir characteristics of the Eunice (N. Mex.) oil field, which produces from a limestone reservoir.

Research was conducted on the function of water in production of oil and on mud fluids used for drilling oil wells; a bulletin dealing with methods of preventing and treating crude-oil emulsions was published; and study of methods of cleaning wells to increase their productivity was continued.

Safety in the petroleum industry.—As a result of work to which the State of Oklahoma contributed financial aid, reports were published on accidents in the petroleum industry during 1937 and on the hazards of mercury vapor in petroleum laboratories.

Natural gas.—Two studies were continued in cooperation with the American Gas Association. One deals with icelike substances, known as gas hydrates, which form in gas wells and pipe lines at temperatures considerably above the freezing point of water; the other is directed toward improvements in methods of gaging and controlling combination (oil-gas) wells. This work led to publication of data on the physical and chemical properties of hydrates formed from various pure hydrocarbon gases and their mixtures, a description of an appa-

ratus developed by the Bureau for investigating properties of liquids in the natural underground reservoirs from which oil and gas are produced, data obtained with that apparatus, and results of flow tests on wells. The Bureau of Mines device for determining compressibility of gases was improved.

Such work helps the natural-gas industry to prevent obstructions to flow of gas caused by formation of hydrates, to attain greater accuracy in measuring gas in high-pressure operations, to adopt better methods of gaging and controlling wells in "distillate"- or "condensate"-type fields that produce large volumes of gas with relatively small quantities of light hydrocarbon liquids, and to improve conservation in those fields.

Oil-field brines.—In Oklahoma, Kansas, and Illinois Bureau engineers studied the disposal of oil-field brines, which are harmful to fresh-water supplies, vegetation, and aquatic and other animal life. The Petroleum Division work in Illinois is aiding oil operators in this leading agricultural State where large quantities of brine are produced, and results of field investigations in eastern Kansas not only suggest efficient methods of disposal but are useful to operators in areas where supplies of surface water are inadequate for increasing recovery of oil by flooding. All of these field studies received financial support from the States in which the work was done.

Chemistry and refining of petroleum.—The refining industry was reviewed from the incoming crude petroleum to the finished products, and the types of petroleum found in Illinois, Arkansas, Louisiana, Oklahoma, and Kansas studied with special emphasis on relationships between characteristics of crude oils and geological environment. Several selected crude oils were analyzed and considered in detail.

A system of analysis for sulfur groups based upon investigations of the types of sulfur compounds in distillates from high-sulfur oils was devised and tested, and its limitations were defined. Oregon Basin (Wyo.) gasoline and kerosene distillates were extracted with liquid sulfur dioxide at various temperatures and solvent-to-oil ratios, and research to determine the types of sulfur compounds in the distillates is progressing.

Asphalts of different consistency, prepared in the laboratory from seven crude oils from Wyoming, three from Arkansas, one from California, and one from Mexico, were subjected to common asphalt tests, and the properties of a 100-penetration asphalt from each crude oil were estimated from these data so that the properties of asphalts from different crude oils may be compared. Moreover, the asphalts were separated by solvents into such constituents as asphaltenes, resins, oils, and waxes.

Helium production.—The Amarillo helium plant produced nearly 9,500,000 cubic feet of salable helium during the fiscal year 1940, or about 50 percent more than in 1939. Approximately 84 percent of the output was supplied to the Government, and the other 16 percent was sold for medical, scientific, and commercial use. More than 450 stations of the Weather Bureau now use helium in meteorological balloons, and estimates indicate that the helium sold for medical use provided at least 34,000 hours of treatment. Figures compiled by the Bureau show that the Amarillo plant has produced 100,012,000 cubic feet of helium during its operating life of a little more than 11 years. Even this production is less than 50 percent of the potential output for an equal period if the plant were run at its rated capacity.

In October 1939 the Bureau completed a new gas well in the Cliffside field; it now has the highest producing capacity of the five wells that supply the helium plant.

Conclusions and recommendations.—As the facilities and qualifications of the Petroleum and Natural-Gas Division have become better known, other Government agencies have called upon its staff for technical assistance with increasing frequency. These requests for special services, especially during the past fiscal year, have hindered members of the division from performing their regular duties; the needs of other Government bureaus for such assistance should receive recognition in the form of increased technical personnel to relieve the burden now placed on the present corps of engineers.

Nonmetals Division

The highest grades of many nonmetallic minerals, such as fluorspar, talc, graphite, magnesite, and clays, usually are imported from abroad. World conditions already have sharply decreased the availability of some of these minerals, and nearly all are subject to curtailment. The Nonmetals Division is employing an increased proportion of its facilities in application of the newer ore-dressing methods to domestic materials in order that satisfactory grades may be produced in this country and the United States rendered more independent of foreign supplies. Methods used are mainly electrostatic and wet filming, such as froth flotation, table agglomeration, and the "sticky surface" process. Greatest effort has been expended on fluorite concentration because of the critical state of fluorspar supplies.

American materials for sanitary wares.—Continued studies at Norris, Tenn., have indicated that almost any variety of working properties can be developed from domestic clays, including the numerous types of kaolin and of ball clay. North Carolina alaskite was found to represent a satisfactory and potentially enormous source of white-

firing, mixed potash-and-soda feldspars to replace Cornwall stone from England.

Flotative and agglomerate concentration of feldspars.—Formal publication of the joint work of the Tuscaloosa (Ala.) and College Park, Md., stations with the aid of a cooperating company was released during the fiscal year. This technique for nonmetallic-mineral separation is novel and of great importance to the domestic feldspar industry, which is in urgent need of an efficient method for recovering feldspar of highest ceramic grade. A second feldspar company to apply the method on a commercial scale is now installing at Erwin, Tenn., a plant based upon the Bureau's suggestions. Feldspars from numerous areas have been tested in the laboratory to determine their response to this treatment, and the results have been very encouraging.

Coal.—Work on the preparation of coal was continued at Seattle, Wash., and Tuscaloosa, Ala., to determine the feasibility of reducing the percentage of ash-forming constituents and cutting down wastes in the coal industry. Recovery of coal from washery sludges and purification of wash water also have been given serious attention. All this research is working toward coal conservation and the maintenance of quality, which is of special importance in a defense emergency.

Utilization of coal wastes (consisting of bony coal, shale, slates, and clays removed from the coal during washing) has been studied, and experiments have been conducted on possible use of the powdered black material for soil conditioning to cause less reflection of heat rays onto crops that are easily burned, greater heating of the soil to accelerate growth (especially in cool weather), and other effects. The assistance of agricultural experiment stations, growers, and other State and Federal agencies has been enlisted in this program.

Optical investigations.—Some useful innovations in apparatus and operating technique have resulted during the year from the work in the petrographic, spectrographic, and X-ray laboratories of the College Park (Md.) and Tuscaloosa (Ala.) stations. Improved methods for obtaining a standard source of light for the spectrograph and higher accuracy in quantitative estimation of alkali metals in nonmetallic-mineral products are reported.

Clay investigations.—Because of the numerous uses to which clays are put and because of the many kinds of clay available, selection of a particular clay as best-fitted for a specific use is not easy. Selection usually is based upon special tests, which are legion; a study is being made to codify these test methods to make them more systematic, as well as more readily applied. A short syllabus and an unabridged one will be published. These will be helpful to the operator of any clay deposit in testing his own clay for its applicability in broader markets than he now reaches.

Electrically heated ceramic kilns.—Continuation of cooperative studies with the Tennessee Valley Authority at Norris, Tenn., has shown that excellent firing conditions can be maintained in electric kilns for face and common brick, fine and common china, and complicated sanitary wares, indicating a wider possible use of newly developed hydroelectric power throughout the country and conservation of fuels. Employment of short, rapidly fired, small-section, multiple-tunnel kilns will greatly reduce the difference in total cost of firing between electrically heated and the fuel-fired kilns in use at present. Both graphite and silicon carbide rods are being used as heating elements.

Prevention of china-plate warpage.—The causes of warpage in china plates have been studied at Norris, Tenn., in cooperation with the Tennessee Valley Authority. It has been found that unglazed china plates that have warped in the first firing can be straightened by nesting in machined, refractory rings in a second firing.

Embrittlement of boiler steel.—Cooperative investigation of the mechanism and means of preventing the intercrystalline cracking or embrittlement of boiler steel was continued at College Park, Md. Special emphasis was placed on the installation of embrittlement detectors on 200 stationary and locomotive boilers and on the collection of data from logs of the operating performance. Greater safety, longer runs, and longer life of boilers are now assured. Methods were improved for evaluation of the true caustic alkali content of numerous commercial boiler waters, and a more rational correlation of cracking and solution composition was developed.

Critical attention was given to checking the value of sodium sulfate, commonly used to prevent this caustic embrittlement, and to searching for other more effective organic or inorganic compounds. Certain tannin-containing materials, such as quebracho, waste sulfate liquors, and similar products, still appear to offer the best means of preventing the cracking of boiler steels.

Refractory raw materials.—Work was continued on certain phases of the beneficiation and utilization of olivine and kyanite in refractories, molding sands, and special fused products. Reviews of investigations on olivine were published, and a general report on kyanite is being prepared. Electrically fused olivine may prove to be an acceptable substitute for imported magnesite for superrefractories. Raw olivine has been used as a replacement for magnesite in parts of steel furnaces.

Diatomite.—Research on the properties and methods for utilizing Pacific Northwest diatomites was continued, and information on methods for treating Maryland diatomites was published. Reasonable assurance of the ultimate development of commercial production of

high-grade diatomaceous earth from these eastern clay-diatomite deposits is indicated.

Subsieve particle-size analysis.—Numerous fine powders have been subjected to particle-size determination in the subsieve range by means of the roller analyzer. Limitations and means for improving the method were studied and a critical comparison was made with other apparatus and methods for particle-size evaluation.

Conclusions and recommendations.—Because of the serious dislocation of world trade by the European war, an increasing proportion of the work of the Nonmetals Division will be diverted to mineral emergency problems and older investigations brought to convenient end points or recessed.

Explosives Division

The major objectives of the Explosives Division are the conservation of life and mineral resources by conducting research and tests pertaining to the development and safe use of explosives, and the explosibility of gases and vapors.

Testing of explosives.—The Explosives Division made 1,619 gallery tests to determine whether or not given samples of explosives would ignite explosive air-gas mixtures or explosive mixtures of coal dust, gas, and air, and also completed 1,051 other explosives-control tests of a physical nature. In the chemical laboratory, 92 analyses were made. During the year five explosives were submitted for "permissibility" tests to determine whether or not they could be used with safety in gassy or dusty coal mines under conditions prescribed by the Bureau. Two of these failed to pass the gallery tests; of the three that met the requirements, only one was placed on the active list.

Mechanism of ignition of firedamp by explosives.—Experimental and theoretical research into the processes by which explosives may ignite firedamp and so initiate serious mine disasters was continued. The results have emphasized the importance of controlling the energy content of the issuing detonation products. The flow condition under which the products mix with and communicate this energy also appears to be outstanding. The study is continuing to guide the development of safer explosives.

Sheathed explosives.—The Bureau has encouraged industry to submit sheathed explosives for examination and testing. A simple procedure for evaluating the increased safety imparted by the sheath when used on a "permissible" explosive has been adopted, and information to aid further development and economical application obtained.

Poisonous gases from explosives.—Testing-station studies have emphasized the increased hazards from poisoning that may result

when carbonaceous blasting plugs or carbonaceous primers are used in the explosives assembly.

Cushioned blasting.—A review of available information on cushioned blasting has shown it to be quite conflicting and has demonstrated the need of experimental information for clarification and development. The experimental study is under way.

Gas explosions.—A procedure for eliminating gas explosions induced by oxygen-cyclopropane mixtures during anesthesia has been developed. Helium is used to replace a portion of the oxygen and has proved very successful because of its high thermal conductivity, good flame-quenching properties, and ease of inspiration.

The limits of inflammability of five combustibles and the minimum ignition temperatures of six combustible vapors have been determined. It has been shown that marked improvement in the ventilation of underground space for the elimination of gas hazards can be obtained when two ducts, one near the bottom and one near the top, are used. Natural differential thermal effects probably are utilized.

Mine fires.—A method has been developed for estimating the amount of heating or oxidation of a stored anthracite from the standard analysis of the stored coal.

Attempts to follow changing underground fire conditions from carbon monoxide analyses have shown that certain bacteria consume carbon monoxide and hydrogen so rapidly as to render such analyses of doubtful value.

Hazards in the use of Diesel mine locomotives.—An investigation of the composition of exhaust gases from Diesel engines has led to recommendations for safe ventilation practices where these engines may be used and have indicated the significance of such analyses in following combustion phenomena in the engine.

Conclusions and recommendations.—The Explosives Division needs to enlarge its staff to keep abreast of the requests being made by State mine inspectors, mine operators, and manufacturers of explosives for investigation of the safety and suitability of new explosives.

Principal Mineralogist

The interest of the public in the search for strategic and critical minerals largely explained the increase of 1,500 in the number of specimens submitted to the principal mineralogist for identification as compared with the 2 preceding years. The total samples received—3,500—was so large that the laboratory staff had to be enlarged to handle the increased volume of work.

ECONOMICS AND STATISTICS BRANCH

The Economics and Statistics Branch contributed to the Government's defense program by supplying factual information on sources, production, consumption, and stocks of strategic minerals for the Army and Navy Munitions Board and the Advisory Commission to the Council of National Defense. Its normal activities comprised the collection, review, and publication of data on all principal mineral commodities; research on special economic subjects; and compilation of the annual statistical survey, Minerals Yearbook. The branch comprised the Coal Economics, Petroleum Economics, Mineral Production and Economics, Metal Economics, Nonmetal Economics, and Foreign Minerals Divisions.

Coal Economics Division

After the outbreak of the European war the Coal Economics Division received numerous requests from coal-trade associations and coal exporters for statistical data and interpretive material on foreign commerce in coal, with special reference to the possibility of expanding the coal-export trade of the United States. It continued to cooperate with the Bituminous Coal Division of the United States Department of the Interior and helped to prepare a joint study on mechanized mining. The Coal Economics Division also maintained contact with the Secretary of the Canadian Fuel Board.

Annual reports.—The anthracite and coke sections completed their annual statistical studies of the anthracite, lignite, and coke industries; the results, with corresponding data on fuel briquets, packaged fuel, and peat, largely form the basis for the division's chapters in Minerals Yearbook covering production, distribution, and consumption of these fuels. In the Anthracite chapter further attention was given to the distribution of that commodity and to a statistical analysis of the competitive-fuel situation in the principal anthracite-consuming States.

Monthly and weekly reports.—Monthly reports included preliminary data on the production of anthracite and of beehive coke, and soon after the first of any year supplements supply preliminary statistics concerning these fuels for the preceding year. A weekly report states the estimated current weekly production of anthracite and of beehive coke, and one issue each month summarizes developments in the Pennsylvania anthracite industry during the previous month. Special articles were prepared by the international coal trade section for the monthly publication, International Coal Trade, including the Competitive Fuel Situation in Ontario and Quebec; Fuel and Power in Canada, 1915-18, 1928, and 1938; Britain's Coal

in War Time; Germany's Coal in War Time; Fuel and Power in Uruguay; and Fuel and Power in Chile.

Since July 1939 a table has appeared in each issue of International Coal Trade that shows (monthly and for the year to date in comparison with corresponding periods of the preceding year) the approximate coal, petroleum, natural gas, and hydroelectricity available for consumption in the United States in their own units of measurement and in terms of coal. Similar data on Canada are shown in a subjoined table. These two countries probably produce 90 percent of the fuel (except wood) and power available in all the Americas.

Correspondence and inquiries.—The international coal trade section devoted an unusually large proportion of its time after hostilities began abroad to answering correspondence and other inquiries about the export coal trade. In addition to the reports on foreign aspects of the coal industry, the section also prepared several special articles at the request of various United States and British coal-trade journals.

Conclusions.—The Coal Economics Division purposes to improve its studies on the competitive-fuel situation and to investigate the economics of byproduct recovery from coking plants and of the supply of and demand for the byproducts of coal processing.

The division's research on the recovery of anthracite from refuse piles and rivers, the progress of strip mining, and the increasing importance of the fuel-briquets and packaged-fuel industries that prepare from fine coal a product having the characteristics of lump coal all measure the results of industrial processes that tend to conserve the Nation's fuel resources and make it more self-sufficient in an emergency.

Petroleum Economics Division

The Petroleum Economics Division collects statistics and makes economic studies of the output and consumption of petroleum and natural gas and their products for the information of Federal and State agencies and of the industry. The scope of this work is such that the oil industry probably is supplied with more comprehensive and current information than is available to any other major enterprise. The division maintains a field office at Los Angeles for collection of California data and another at Bartlesville, Okla., for contact with State agencies and for assembly of information on natural gas.

Forecasts of demand.—The division has issued monthly forecasts of the demand for motor fuel and for crude petroleum by States

of origin since July 1935. This information is of outstanding interest to State conservation agencies in connection with proration programs to avoid waste and prevent the uneconomic accumulation of oil in storage. Improvements in forecasting methods have resulted in attainment of a degree of accuracy that has made the forecasts a reliable guide to the trend of operations in the industry.

International studies.—Data on the trends of world production of oil, international trade, and world consumption have been issued regularly in monthly reports and data on world prices in quarterly reports. These publications have been of especial use since the disruption of world trade by the European war.

Special investigations.—The annual survey of sales of fuel oil, range oil, and kerosene, by States, represents a worth-while contribution to information on the domestic use and regional distribution of oil products. The early issue (in June 1940) of the annual list of petroleum refineries, showing their situation and capacity, has been of exceptional timeliness under existing conditions. A special survey of aviation gasoline was inaugurated in October 1939 to cover production, stocks, and domestic demand on a monthly basis. Two economic papers prepared by the division were issued during the year. Economic Paper 20 made available unpublished statistics of detailed operations, by refinery districts; and Economic Paper 21 discussed the trends and seasonal variations in factors influencing domestic motor-fuel demand on a monthly basis.

Mineral Production and Economics Division

The Mineral Production and Economics Division collected mine-production statistics for gold, silver, copper, lead, and zinc in the United States; supervised preparation of the annual volume—Minerals Yearbook; assembled and interpreted statistics on employment, accidents, and explosives as related to the mining industries; and concluded the Bureau of Mines—Work Projects Administration cooperative study of changes in mineral technology with regard to their effect on output per man. Early in the year the chief of the division was transferred to the United States Department of Commerce to conduct the census of mines and quarries, and members of the division have cooperated closely in this work.

Metal-mine statistics.—Preliminary reviews of metal mining in the 13 Western States that produced nonferrous metals in 1939 were released early in January 1940, and recapitulations summarizing the mine production of gold, silver, copper, lead, and zinc were distributed soon afterward. Final detailed statistics for all metal-mining States were completed by the middle of June. During the year compilation

of the historical record of metal mining in the Western States continued to progress.

Minerals Yearbook, 1939, was issued in September 1939. The total circulation of this volume was about 9,000 copies, and the sales edition was virtually exhausted before the close of the fiscal year. For the past 2 years, about two-thirds of the chapters have been printed separately; however, this advance distribution evidently has not reduced sales of the bound volume.

Employment and accidents.—To supply mining companies and safety engineers with uniform, comparable data that state the number and causes of accidents and the number of men employed in the principal branches of the mining industry, the division continued its annual statistical surveys of mines, quarries, and related establishments.

Rivalry in operating without accidents was stimulated by contests and the award of trophies to mining and sand and gravel companies that achieved the most outstanding safety records. The winners were determined by statistical analysis of reports on accidents and man-hours of exposure to mining hazards submitted by the companies participating.

The annual statistical survey of the production of explosives in the United States was based upon reports from manufacturing companies and showed the quantity used for mining and for other industrial purposes.

Changes in mineral technology and output per man.—The division concluded its cooperative study with the Work Projects Administration of technologic changes and output per man in selected mineral industries in the United States. Reports on petroleum, bituminous-coal mechanization, gold placers, iron ore, and progress in rock drilling either were released or were ready for printing at the end of the year, raising to 14 the total of reports completed in connection with the cooperative program. The Bureau of Mines will publish a report on gypsum based upon an investigation of this series. Two other manuscripts—on lead and zinc and on anthracite—have not been completed in final form, but may be prepared for publication later.

Conclusions and recommendations.—Moderate expansion of the personnel and functions of the division would make possible material improvement in service to the mining industries. The field officers should be enabled to complete compilation of the detailed record of metal mining by districts and individual mines, as well as to inaugurate quarterly surveys of metal-mine output. The work on accident statistics should include detailed interpretation by causes,

and a careful analysis thereof should be brought to the attention of the operators. Furthermore, the scope of accident statistics should be expanded to include the petroleum and sand and gravel industries. Ability to meet increasing demands for information depends directly on the extent to which these deficiencies are rectified.

Metal Economics Division

Accelerated activity with regard to strategic minerals was the chief interest of the Metal Economics Division, particularly after declaration of the emergency.

National defense.—The head of the division served as a member of the Mineral Advisory Committee to the Army and Navy Munitions Board, and other specialists in the division advised military service and procurement agencies in connection with the Government stock-piling program. The Army and Navy Munitions Board requested the division to inaugurate special monthly canvasses on the production, consumption, and stocks of strategic and critical metallic raw materials. Owing to shortage of personnel the division was unable to comply fully with the request; but monthly surveys of the five most important strategic minerals were undertaken, and the results of these studies have been invaluable to the service agencies in planning national defense. For the first time current data have been developed on the domestic position of these indispensable but deficient raw materials. This information also is of use in connection with conservation, for planning orderly development of domestic resources.

The division prepared special reports in answer to a greatly increased number of requests for information, particularly on strategic minerals, from the Congress, other Government agencies, industry, and the public.

The experienced personnel and the data files of the Metal Economics Division were placed at the disposal of the Advisory Commission to the Council of National Defense early in June 1940. For 2 months the consultant on minerals of the Commission maintained headquarters in the division and was assisted by its staff in organizing the work on minerals.

Secondary metals.—The secondary metals section, stationed at Pittsburgh, expanded its activities during the year. In addition to the annual canvass on consumption of iron and steel scrap there was inaugurated, at the request of and in cooperation with industry, a series of quarterly reports on consumption and stocks of iron and steel scrap. These basic data, which had not been available before, proved extremely helpful to other Government agencies and to indus-

try in connection with the recurring demand for licensing exports of this material.

Another feature of this section's work was the complete revision, after detailed study, of the method of collecting and presenting basic data on nonferrous scrap. In addition to the service rendered industry in general and the scrap-metal trade in particular the enlarged activities in both ferrous and nonferrous scrap are vitally important to the service agencies in matters of national defense. As every pound of scrap metal recovered and reused eliminates the necessity of extracting and processing a pound of virgin metal the conservation aspects of scrap utilization are immediately apparent.

Other services.—During the fiscal year 1940 the Metal Economics Division conducted an increased number of statistical canvasses, prepared 116 manuscripts for publication, and answered 3,500 requests for information.

Conclusions and recommendations.—The present emergency has demonstrated the wisdom of previous recommendations concerning the collection of consumption and stock data on such important strategic metals as manganese, chromium, tin, tungsten, and mercury. These data are vital in formulating plans for industrial mobilization in an emergency and should not only be kept currently available but should be expanded to include all strategic and critical metals and continued up to date even after the present crisis has terminated. Adequate statistics are now available on production, shipments, and producers' stocks of the more important metals, but reliable records of actual consumption and the balance of supply and demand are not known because of lack of information on consumers' inventories. These deficiencies could be supplied by a moderate increase of the staff.

Nonmetal Economics Division

To the normal duties of the Nonmetal Economics Division—collection of statistics and economic data and dissemination of marketing information on nonmetals—were added various strategic-mineral assignments and many phases of defense work involving direct service to the Army and Navy Munitions Board, the National Defense Commission, and the Procurement Division. Moreover, increased information was demanded by prospective producers and consumers of products affected or likely to be affected by war developments.

National defense.—Stocks on hand, current and estimated future requirements, and other data necessary to perfect military procurement plans were ascertained in respect to industrial diamonds, asbestos, graphite, mica, and quartz crystals. Special studies were made of other commodities necessary to a military program (such as iodine, magnesium compounds, fertilizers, refractories, and abrasives)

and also such specialties as crucible clays, pencil clays, and grinding pebbles that formerly were imported but now must be obtained from domestic sources.

Publications.—Each year the division prepares the annual reviews of more than 115 groups of nonmetals and 20 rare metals that comprise 19 chapters of Minerals Yearbook. A comprehensive résumé of the nonmetallic-mineral industries during 1939 was published in March, and current statistics and other information were released in 54 mimeographed reports and magazine articles. Material for more than 170 pages of Mineral Trade Notes was compiled in the division. A graphic survey of the lime industry, a review of the potash situation, and a joint report with the Foreign Minerals Division covering the cement industries of Latin America were published during the year. Eight papers were written for trade journals or to be used as public addresses; one lecture outlining the importance of minerals and the need for conserving them by more efficient use was issued later as Bureau of Mines Information Circular 7118, *More Jobs for Minerals*.

Other services.—In addition to tabulating nearly 22,000 questionnaires the division answered 4,500 inquiries from other Government agencies and from the public and distributed 176 lists of producers and 1,242 lists of buyers during the fiscal year.

Conclusions and recommendations.—Of 170 items on a recent list of subjects handled by the Bureau of Mines, the Nonmetal Economics Division is responsible for economic and statistical information on 84. The chief engineer alone is the nominal specialist for 38 of these and the assistant chief engineer for 23; actually the number of items they handle is several times as large as their nominal assignments, which cover major subjects without specifying many of their ramifications. Obviously, it is impossible to keep pace with all developments in so many fields and fulfill administrative duties as well. War-preparedness activities have brought added responsibilities, and unfortunately this program is concentrated upon items for which no other specialists have been developed. Additional technically trained specialists are badly needed, and more high-grade clerical assistance is imperative to check work done under high pressure.

Foreign Minerals Division

Effects of European war.—Economic information on world output, consumption, and movement of mineral raw materials became subject to official censorship during the last three quarters of the fiscal year, and 18 countries suspended publication of official production and foreign trade statistics—a fact that indicates the strategic and military value belligerents place on such data. The difficulties experienced in consequence of wartime restrictions on distribution of

official statistics have, however, resulted in closer cooperation between the Bureau's Foreign Minerals Division and the United States Department of State. More extensive research by the division staff has also been necessary to obtain material for Minerals Yearbook.

Foreign mineral specialist.—As a practical demonstration of the President's "Good Neighbor" policy, the Bureau of Mines foreign mineral specialist was assigned to Latin America in May 1939 after several years' duty in Europe. During the past year he prepared economic surveys of the mineral resources, production, and trade of Bolivia, Peru, Chile, and Argentina for publication in the Foreign Minerals Quarterly. The assistance of the foreign mineral specialist to the procurement agencies of the United States Government became more pronounced as war spread in Europe, cutting off normal sources of mineral supply. Availability in South America of several outstanding strategic minerals, including tin, tungsten, chromite, antimony, manganese, and mica, coupled with the fact that more extensive development of these resources may (to the mutual advantage of all countries concerned) reduce our present dependence on countries and their colonial possessions now involved in the conflict, justifies this expansion of Bureau of Mines activities in Latin America. Toward this end funds have been requested of Congress to supplement those allotted in appropriations for the fiscal year 1941 to enable the Bureau to cooperate with certain South American countries.

HEALTH AND SAFETY BRANCH

The Health and Safety Branch, which comprises the Health Division and the Safety Division, studied conditions that affect the health of workers in the mineral industries, conducted safety-training courses, and answered emergency calls for assistance after catastrophes at mines and mineral plants.

Health Division

The Health Division continued its efforts to improve hygienic conditions in the mineral industries in order to maintain health and increase efficiency and morale, thus conserving the productivity of American workers, a resource indispensable to national defense. Studies pertinent to the safe use of Diesel locomotives underground were undertaken; respirators and gas masks were tested and approved; information important in alleviating compressed-air illness was obtained; an X-ray method for determining free silica was developed; several health surveys were made; and control measures were recommended.

Gas analysis.—Approximately 1,400 air or gas samples were analyzed to ascertain efficiency of ventilation, to determine possible hazards from methane and other gases evolved from mine strata, and to

discover the nature of gases from blasting and mine fires and following mine explosions.

Compressed-air illness.—A report dealing with the use of respiratory protective devices under pressure was published. Two publications, one on the use of helium-oxygen mixtures to prevent "ear-block" and one on the administration of oxygen during decompression to prevent compressed-air illness, are in press.

Diesel exhaust gas.—A report was issued on the composition of exhaust gas from Diesel engines when operating in proper mechanical condition; other reports are being prepared. The data are essential in establishing regulations for the safe use of Diesel locomotives underground; this work is being continued in cooperation with the Explosives Division.

Respiratory protective devices.—The continued heavy demand for lists of approved respiratory protective devices is evidence of the importance attached to this work. Seventeen approvals covering various types of such devices were granted during the year, the second largest number approved in any one 12-month period.

Dust studies.—The composition and concentration of dust and fume in the air of a zinc smelter were ascertained and measures for improvement recommended. The concentration of dust in the air caused by dumping parcel-post packages from sacks and sorting was found to be below the probable permissible limit. The X-ray and spectrographic procedures for analyzing samples of dust from the air were improved further. An X-ray method for determining free silica was developed that has advantages over existing methods. More information was obtained on operating characteristics of the impinger and the electric precipitator, devices for collecting dust from the air.

Conclusions and recommendations.—The national defense program necessitates rapid expansion of industrial activities, which will increase existing hazards and introduce many new ones in the mineral industries as well as in many other types of work. Safe, hygienic working conditions must be provided if inefficiency and delays are to be avoided; therefore, it is necessary to give earnest consideration to possible effects on health and safety when existing operations are expanded or new ones introduced.

The Health Division of the Bureau of Mines comprises 18 persons, manifestly an inadequate staff to handle the multiplicity of health problems pertaining to the welfare and efficiency of the million or more workers in the mineral industries. The personnel of this group should therefore be increased severalfold to cope with the numerous problems certain to arise when the national defense program gets definitely under way.

Safety Division

Safety Division engineers trained members of the mining industries in first-aid and mine rescue; responded to emergency calls for assistance after mine fires and explosions; inspected mines to discover unsafe conditions and made reports thereon to mine operators; and attended safety meetings and first-aid competitions.

Personnel.—The personnel of the Safety Division included 32 engineers, 29 safety instructors, 20 clerks, and 7 other employees, a total of 88 persons. These were on duty in various mining States, with headquarters at 20 cities, representing 15 States and Alaska.

Training courses.—In the fiscal year 1940 the Safety Division trained 93,878 members of the mining and allied industries in first aid and mine rescue. The work was conducted in 965 cities in 41 States. In 1939, 120,733 persons were trained and in 1938, 105,093. Since inception of the Bureau in 1910, the total number of Bureau of Mines first-aid and mine rescue courses completed has been 1,361,465, distributed among the several branches of mining as follows: Coal mining, 986,467; metal mining, 149,661; petroleum industry, 108,362; metallurgical plants, 34,416; nonmetallic mining, 22,398; cement plants, 14,125; tunnel work, 7,256; and miscellaneous mining activities, 38,780.

Those who work for the Safety Division in the field (about 60 in all) ordinarily meet over 300,000 persons in the mining industries annually and relay to them the Bureau's safety experience and teaching. Only 2 of the 7 all-steel mine safety cars were in active use; 62 passenger automobiles and automotive trucks were operated and traveled 913,839 miles, to which should be added 20,024 miles of travel by employees in personally owned automobiles.

Mine fires and explosions.—During the year 18 mine explosions, in 12 States, and 28 mine fires, in 11 States, were investigated, and the Safety Division personnel aided in rescue and recovery work at virtually all of them where life was involved. Deaths in mine explosions totaled 206, including 191 in 3 major disasters—a sad contrast to the fiscal year 1939, when there was not 1 major fire or explosion disaster in any mine in the United States; this meant that in 1939 no single explosion or mine fire cost 5 or more lives.

In spite of the bad record for 1940, safety practices recommended by the Bureau have improved mining conditions. One of these practices is rock dusting, which is known to retard the spread of explosions; if the three mines that suffered the most serious disasters in 1940 had fully complied with the Bureau's recommendations on safety in operation, especially rock dusting, the death lists would have been much smaller.

The Safety Division investigated 79 miscellaneous accidents in 25 States (including those from roof falls, explosives, electricity, and other causes) and numerous surface explosions of black powder, dynamite, pulverized fuel, and gas.

Mine reports.—Two hundred and sixty-one reports on safety conditions at individual mines or plants in 34 States were made during the year; some were transmitted to the operating company, with constructive criticism of existing conditions and definite recommendations for improvement. In consequence of these reports and the verbal suggestions by Bureau men during or after the inspections upon which they were based, operators made hundreds of important alterations in equipment, methods, and practices and safety in mines was increased thereby. Many such changes have been reported by field men, and several hundred letters were received during the year from mining people expressing their appreciation of these and other services.

Other activities.—During the past year, 1,425 persons in 24 States were qualified to teach first-aid courses and earned provisional or final first-aid instructors' certificates, raising the total to 13,287 issued in 45 States since 1930. Most of these first-aid instructors would be available and fully prepared to give first-aid training to both military units and civilians in a war emergency.

Certificates of 100-percent first-aid training were issued in 17 States to 205 mines or plants wherein every person had completed the Bureau of Mines first-aid course; to June 30, 1940, these certificates of 100-percent first-aid training had been issued to 2,520 mines and plants; on an average, 229 per year of these 100-percent first-aid certificates have been issued for the past 6 years.

Ninety-seven expert mine rescue men completed the Bureau of Mines standard course in rescue and recovery operations and earned certificates, raising the total to 3,378. In addition to full training in the advanced rescue and recovery course, a special course in mine rescue training was given to 481 applicants for coal-mine foremen's certificates in West Virginia, at the request of the chief of the State department of mines. The Bureau's accident-prevention course for higher officials in coal mining was completed by 205 men, and 336 others took part of the course; in all, 8,398 such certificates have been issued to mine officials in 16 States since 1930, and 5,057 others have studied part of the course.

Eleven new safety clubs (Holmes Safety Association chapters) were organized in 6 States; 488 of these mining-community organizations have been established, and 29 States are represented.

Special studies and reports covered a multitude of subjects, including rock dusting, ventilation, electricity, haulage, air conditioning,

wetting methods, detection of gases, testing roof, reducing air dustiness, and other health and safety problems.

The Safety Division assisted at 60 first-aid contests in 16 States and British Columbia; 6,636 persons participated in these contests. Twenty-four safety exhibits and demonstrations were prepared for 13 States; field engineers attended 790 safety meetings in 35 States; and 50 manuscripts were prepared for publication.

Conclusions and recommendations.—The services of the Safety Division in first aid and rescue training continue to be in demand. Because of the past year's unfortunate record as to mine explosions, however, more emphasis in future should be placed upon instruction in accident prevention. Experience at individual mines has proved that accidents can be eliminated if the entire mine organization, from officials to miners, whole-heartedly determines to prevent them.

ADMINISTRATIVE BRANCH

The Administrative Branch comprised the Information and Office Administration Divisions.

Information Division

The work of the Information Division included the editing and distribution of publications, supervision of motion-picture production and circulation, maintenance of the Bureau library, and preparation of exhibits.

Editorial.—During the fiscal year 12 bulletins, 17 technical papers, 2 miners' circulars, 2 economic papers, 69 chapters comprising Minerals Yearbook, 1940, 2 schedules, 1 annual list and index of publications, 12 monthly lists of publications, 1 motion-picture list, 1 revised handbook, and 2 miscellaneous publications were edited and sent to the printer—a total of 121 printed publications. Moreover, during the year 34 publications were prepared and sent for reprinting, including 1 bulletin, 3 technical papers, 21 Minerals Yearbook chapters, 7 miscellaneous publications, and 2 handbooks.

The editorial section also edited 71 reports of investigations and 47 information circulars, as well as 45 periodical, cooperative, and miscellaneous reports.

Printing funds permitted only part of the Bureau's output to be published at Government expense; consequently, 189 papers were prepared for the technical and trade press. The reports handled during the year—507 in all, compared with 483 in 1939—involved the editing of 26,650 pages of manuscript.

Publications.—During the fiscal year 146,800 copies of the free editions of Bureau publications and approximately 300,000 reports of investigations, information circulars, and monographs were distrib-

uted by the publications section. In addition, the Superintendent of Documents sold about 100,000 copies of the Bureau's printed reports.

Numerous brief statements announcing the issuance of new publications or describing current investigations were supplied to the daily and technical press.

About 75,000 letters requesting publications or information on the Bureau's activities were received.

Library.—The year's accessions to the library comprised 4,523 books, 380 periodicals were received currently, and 24,260 books and periodicals were loaned for use outside the library.

Motion-picture production.—To help disseminate information on safety and efficiency in the mineral industries, the Bureau maintains a library of educational motion-picture films believed to be the largest in the world. These films are prepared under the supervision of the Information Division, through cooperation of industrial concerns that bear the entire cost of production and of providing copies for loan by the Bureau. During the year 1,124 sets of new films, comprising 1,962 reels, were added to the library.

Motion-picture circulation.—Circulation of the Bureau's motion-picture films is centralized at the Pittsburgh (Pa.) Experiment Station, but there are 16 subdistributing centers for films throughout the country, selected with regard to accessibility. The films are loaned to schools, churches, civic and business clubs, miners' local unions and chapters of the Holmes Safety Association, and similar organizations. No charge is made for use, but exhibitors are asked to pay transportation charges. On June 30, 1940, the Bureau had 3,006 sets of films, including 5,499 reels and aggregating 2,456,000 feet. During the year films were shown on 101,350 occasions to an attendance of 8,584,000 persons.

Graphic services.—Graphic services, including drafting, photography, and multilithing, are also centralized at Pittsburgh. Over 1,300 drawings were prepared and over 30,000 prints of various types made.

Exhibits.—The Division prepared and installed 14 exhibits illustrating Bureau activities at expositions and conventions.

Office Administration Division

The Office Administration Division handles personnel matters, property records, accounting, multigraphing and mimeographing, and general administrative routine.

FINANCES

The total funds available to the Bureau of Mines for the fiscal year ending June 30, 1940, including direct appropriations, departmental allotments, reappropriated balances, and sums transferred from other departments for service work, were \$3,183,455.29. Of

this amount \$3,048,810.29 was spent, leaving an unexpended balance of \$134,645.00. On the regular work of the Bureau, \$2,945,361.06 was expended. These figures are subject to revision due to unpaid obligations.

Table 1 presents classified and complete information regarding the financial history of the Bureau since its establishment in 1910.

Table 2 gives a statement of the distribution of congressional appropriations to the branches and divisions and the expenditure of these funds in 1940 by Bureau divisions.

TABLE 1.—Bureau of Mines Appropriations and Expenditures, Fiscal Years Ended June 30, 1911–40

Fiscal year	Appropriated to Bureau of Mines	Departmental allotments ¹	Funds transferred from other departments ²	Total funds available for expenditure	Unexpended balances	Total expenditures	Expenditures, exclusive of service items ³
1911.....	\$502,200.00	\$34,200.00	-----	\$536,400.00	\$22,818.27	\$513,581.73	\$513,581.73
1912.....	475,500.00	45,640.00	-----	521,140.00	6,239.77	514,900.23	514,900.23
1913.....	583,100.00	47,850.00	-----	630,950.00	4,087.20	626,862.80	626,862.80
1914.....	664,000.00	57,307.79	-----	721,307.79	4,678.29	716,629.50	716,629.50
1915.....	730,500.00	55,424.60	-----	785,924.60	4,178.11	781,746.49	781,746.49
1916.....	757,300.00	48,710.87	-----	806,010.87	9,058.63	796,952.24	796,952.24
1917.....	981,060.00	52,400.00	-----	1,033,460.00	48,588.10	984,871.90	984,871.90
1918.....	1,467,070.00	51,901.98	\$3,062,000.00	4,580,971.98	395,745.10	4,185,226.88	1,172,939.64
1919.....	⁴ 3,245,285.00	49,542.86	⁵ 8,600,000.00	11,894,827.86	2,452,236.78	9,442,591.08	1,137,471.37
1920.....	1,216,897.00	52,800.00	-----	1,269,697.00	9,592.18	1,260,140.82	1,245,891.36
1921.....	1,362,642.00	62,618.72	666,720.00	2,091,980.72	13,985.89	2,077,994.83	1,412,923.15
1922.....	1,474,300.00	59,800.00	182,200.00	1,716,300.00	52,120.45	1,664,179.55	1,483,038.47
1923.....	1,580,900.00	70,814.30	97,100.00	1,748,814.30	10,959.08	1,737,855.22	1,640,840.57
1924.....	1,784,959.00	50,710.00	347,820.00	2,183,489.00	38,085.43	2,145,403.57	1,804,800.41
1925.....	2,028,268.00	57,500.00	236,465.86	2,322,233.86	107,743.20	2,214,490.66	1,998,669.20
1926.....	1,875,010.00	81,220.00	510,501.15	2,466,731.15	28,891.78	2,437,839.37	1,841,150.80
1927.....	1,914,400.00	94,443.39	325,000.00	2,333,843.39	44,871.29	2,288,972.10	1,926,910.12
1928.....	3,025,150.00	113,266.45	328,000.00	3,466,416.45	⁷ 736,235.62	2,730,180.83	1,997,270.66
1929.....	2,725,118.00	103,000.00	205,500.00	⁷ 3,753,094.67	⁸ 152,701.34	3,600,393.33	2,280,960.68
1930.....	2,274,670.00	123,300.00	166,200.00	⁸ 2,684,386.38	⁹ 135,714.93	2,548,671.45	2,216,995.72
1931.....	2,745,060.00	120,680.91	166,500.00	⁹ 3,134,595.10	¹⁰ 195,534.37	2,939,060.73	2,304,121.45
1932.....	2,278,765.00	137,866.48	194,500.00	¹⁰ 2,770,712.18	¹¹ 344,689.43	2,426,022.75	2,186,799.92
1933.....	1,860,325.00	75,100.00	184,000.00	¹¹ 2,361,138.96	¹² 475,895.41	1,885,243.55	1,710,949.42
1934.....	1,574,300.00	50,230.00	17,000.00	¹² 1,872,586.04	¹³ 397,131.28	1,475,454.76	1,254,864.72
1935.....	1,293,959.07	50,000.00	126,513.10	¹³ 1,520,472.17	¹⁴ 34,154.47	1,486,317.70	1,349,490.11
1936.....	1,970,311.00	69,500.00	47,570.00	¹⁴ 2,114,966.51	¹⁵ 14,074.34	2,100,892.17	2,052,751.87
1937.....	2,093,200.00	69,000.00	73,000.00	¹⁵ 2,237,812.45	¹⁶ 8,700.66	2,229,111.70	2,161,472.73
1938.....	2,272,720.24	83,000.00	62,300.00	¹⁶ 2,421,985.69	¹⁷ 59,920.71	2,362,064.98	2,286,858.08
1939.....	2,857,335.62	88,790.00	96,650.00	¹⁷ 3,086,719.30	¹⁸ 76,394.43	3,010,324.87	2,373,409.85
1940.....	2,849,676.33	93,290.00	96,125.00	¹⁸ 3,183,455.29	¹⁹ 134,645.00	3,048,810.29	2,945,361.06
1941.....	2,930,880.00	91,790.00	80,300.00	¹⁹ 3,102,970.00	-----	-----	²⁰ 2,816,180.00

¹ Includes printing and binding, stationery, and contingent funds.

² Includes proceeds from sales of residue gas.

³ Service items include Government fuel yards, helium, and other investigations and services for other departments.

⁴ Includes gas investigations for War Department.

⁵ Includes \$1,586,388 for Government fuel yards.

⁶ Includes War Minerals Relief Commission, \$8,500,000.

⁷ Includes \$719,476.67 unexpended balance reappropriated.

⁸ Includes \$120,216.38 unexpended balance reappropriated.

⁹ Includes \$102,354.19 unexpended balance reappropriated.

¹⁰ Includes \$159,580.70 unexpended balance reappropriated.

¹¹ Includes \$241,713.96 unexpended balance reappropriated.

¹² Includes \$231,056.04 unexpended balance reappropriated.

¹³ Includes \$50,000 unexpended balance reappropriated.

¹⁴ Includes \$27,585.51 unexpended balance reappropriated.

¹⁵ Includes \$2,612.45 unexpended balance reappropriated.

¹⁶ Includes \$3,965.45 unexpended balance reappropriated.

¹⁷ Includes \$8,399.29 unexpended balance reappropriated, and balance of \$35,544.39 receipts from sale of helium and other products.

¹⁸ Includes \$13,541.41 unexpended balance reappropriated, and balance of \$58,822.55 receipts from sale of helium and other products.

¹⁹ Includes \$31,309.25 unexpended balance reappropriated, and balance of \$85,452.95 receipts from sale of helium and other products.

²⁰ Estimated.

TABLE 2.—Bureau of Mines Expenditures, Fiscal Year 1940

Branch or division	General expenses	Operating rescue cars and stations and investigations of accidents	Testing fuel	Mineral mining investigations	Oil and gas investigations	Expenses mining experiments stations	Economics of mineral industries	Care, etc., buildings and grounds, Pittsburgh, Pa.	Investigation of domestic sources of mineral supply	Purchase of land, etc., Bruceton, Pa.	Helium production	Development and operation helium properties S. F.	Engineering, Bureau of Engineering	Appreciation of foreign currency	Printing and binding	Contingent expenses, Department of Interior	Total
Office of the Director	\$9,745					\$372											\$10,117
Office of the Assistant to the Director	7,762					865											8,627
Total	17,507					1,237											18,744
Administrative Branch:																	
Office Administrative Division	46,735	\$26,068	\$275			2,110	\$7,241		\$5,616		\$3,537	\$420			\$2,772	\$7,892	102,866
Information Division	1,041	8,823	14,522	\$11,084	\$14,002	22,419	10,167	\$5,244			256	680			4,288		92,506
Total	47,776	34,891	14,797	11,084	14,002	24,529	17,408	5,244	5,616		3,793	1,100			7,040	7,892	195,172
Technologic Branch:																	
Coal Division		93,189	241,720					89,612		\$29,825					7,815		432,336
Explosives Division		94,803													7,921		125,549
Metallurgical Division				126,989		223,785			72,325						7,042		436,141
Mining Division		51,393		127,208		22,768			266,015			\$3,931			9,744		481,059
Nonmetals Division						263,275									1,390		264,665
Petroleum and Natural Gas Division					245,630						68,439	26,186			4,241		344,496
Principal Mineral Technologist				8,834													8,834
Total		239,385	241,720	263,031	245,630	515,828		89,612	338,340	29,825	68,439	26,186	3,931		31,153		2,093,080
Economics Branch:																	
Coal Economics Division							28,466								433		28,899
Foreign Minerals Division							26,507										26,507
Metal Economics Division							48,844								362		49,206
Mineral Production and Economics Division																	
Nonmetal Economics Division							100,194								26,194		126,388
Total							50,800								970		51,820

TABLE 2.—Bureau of Mines Expenditures, Fiscal Year 1940—Continued

Branch or division	General expenses	Operating rescue cars and stations and investigations of accidents	Testing fuel	Mineral mining investigations	Oil and gas investments	Expenses mining experiments stations	Economics of mineral industries	Care, etc., buildings and grounds, Pittsburgh, Pa.	Investigation of domestic sources of mineral supply	Purchase of land, etc., Bruceton, Pa.	Helium production	Development and operation helium properties S. F.	Engineering, Bureau of Engineering	Appreciation of foreign currency	Printing and binding	Contingent expenses, Department of Interior	Total
Economics Branch—Continued:																	
Petroleum Economics Division							58,830								2,123		60,953
Total							313,691								30,082		343,773
Health and Safety Branch:																	
Safety Division		330,853													16,965		347,818
Health Division		50,174													50		50,224
Total		381,027													17,015		398,042
Total appropriation	66,000	656,000	257,400	274,860	260,000	542,000	331,500	95,000	350,000	35,000	103,541	112,739	4,000	\$2,125	85,290	8,000	3,183,455
Total expenditures	65,283	655,303	256,517	274,115	259,632	541,594	331,099	94,856	343,956	29,825	72,232	27,286	3,931		85,290	7,892	3,048,811
Balances	717	697	883	745	368	406	401	144	6,044	5,175	131,309	185,453	69	2,125		108	134,644

1 Available for expenditure in fiscal year 1941.



GEOLOGIC STUDIES PROMOTE EFFICIENT DEVELOPMENT.

Upper: The Geological Survey examines areas such as this in the front range of the Rockies, which forms the boundary between the crystalline rocks to the west, containing gold, silver, tungsten, and other metals, and the eastward-dipping sedimentary rocks with resources of clay, coal, and petroleum.

Lower: Dredging placer gold near Fairbanks, Alaska.

GEOLOGICAL SURVEY

W. C. Mendenhall, *Director*

WITH a full sense of its responsibilities in the present as in earlier national emergencies, the Geological Survey in 1940 emphasized those phases of its activities that bear upon the program of national defense. Although funds available for the prosecution of its work were more than a million dollars less than in 1939, owing principally to the cessation of Public Works allotments, nevertheless, the direct appropriations, which previously had been restored to their earlier level and were supplemented by transferred appropriations, cooperative funds, etc., enabled the Survey to close the fiscal year with a gratifying record of accomplishment.

As war disrupts the normal channels of commerce, nations suddenly become acutely conscious of their dependence upon international trade to supply many of those materials that have become a part of normal life. We can soon learn to do without nonessentials, but for successful defense under modern conditions some materials are indispensable. None are more important among these than certain of the minerals necessary to make the machinery of war. Richly endowed as it is with a great variety of mineral resources, the United States is nevertheless deficient in some of these. They must be acquired by importation while sea lanes are still open, by discovery of new supplies at home, or by learning to use lower grades than those to which we are accustomed.

This field of the strategic and critical minerals is one in which the Survey is necessarily active. Through its normal activities over a long period and its special studies during the first World War, it has acquired an intimate acquaintance with the mineral supplies of the United States. It is thus especially well equipped to advise those charged with the national defense about our known resources and what must be done to augment them; and to pursue further intensive studies that are revealing deposits, inadequately known, perhaps not normally usable, but quite capable of extraction and use under emergency conditions. Thus the field of dependence upon outside sources is being narrowed and self-sufficiency broadened.

Congress made a small special appropriation for studies of this character for the fiscal year 1940, funds becoming available on August 10, 1939. A number of geologic parties were promptly or-

ganized and sent to the field to search for and examine possible sources of manganese, antimony, chromite, quicksilver, tin, tungsten, and mica in many of the States. Condensed reports containing estimates of grades and quantities of the ores of these metals and minerals were submitted during the year on 18 of the projects, and 4 of these reports were in the hands of the printer by July 1.

Although there has been a concentration of energies on the strategic minerals studies, nevertheless the regular program of geologic and related investigations was carried forward. New Federal projects were begun and others completed in a number of important mining regions, involving studies of vanadium, coal, oil, potash, etc., and much other normal geologic work was done in cooperation with the States and with many national groups.

Stimulated by the devastating succession of droughts and floods in recent years and the consequent growing national water consciousness, the Survey's investigations of surface and underground waters have been growing markedly. Direct appropriations have increased steadily, contributions from States and municipalities have been larger, and funds transferred from other Federal agencies have been mounting. This last is particularly true of the Corps of Engineers of the Army, which has supervision of Federal investigations and improvements for flood control and which must have the basic information obtained by the Geological Survey as a proper approach to the problems of flood control. In 1940 the Survey's investigations for the Army Engineers were the most extensive in our history. Indications are that demands for such information will increase as population grows and the necessity for protective and conservational efforts are more fully realized.

One of the vital needs in the conduct of military operations is the availability of adequate topographic maps. Maps cannot be made after an emergency arises. They must be ready in advance.

The Survey has long advocated an acceleration in its mapping program, both as a base for normal peacetime development and as an essential to national defense. The War Department, directly responsible for land defense, is acutely conscious of map deficiencies. It has joined the Geological Survey in urging that a mapping program be made an essential part of the defense program. Congress indicated a partial recognition of this situation by providing \$1,210,350 before the close of the year for mapping strategic areas in accordance with priorities to be determined by the Secretary of War. This sum is far short of the sum needed and recommended for this work, but it is encouraging as a recognition of a principle.

Approximately 25,000 square miles in the United States and Puerto Rico were covered by topographic surveys during the fiscal year

1940. Fourteen States, Puerto Rico, and the Tennessee Valley Authority cooperated in much of this mapping. As in 1939, stereophotogrammetric equipment and the aerocartograph, instruments by which mapping is accomplished through the use of airplane photographs, were used in mapping a part of the total area, notably that in the Tennessee Valley.

A small but specially trained staff of scientists and engineers continued their investigations of Alaska's mineral resources. The results of their work in 1940, as in previous years, will doubtless contribute much to the development of the Territory and especially to the industry that to date has produced minerals valued at more than \$800,000,000 and is adding some \$25,000,000 each year. Particularly significant in the 1940 work were the examinations of strategic minerals and a detailed mapping project undertaken at the request of the War Department.

Continuing its activities in the administration of the land-classification and mineral-leasing laws, the Geological Survey made more than 7,500 reports upon the mineral resources, water power, or storage possibilities of public lands, at the same time safeguarding the Government's ownership of great reserves of coal, oil, gas, potash, phosphate, and other minerals. Technical supervision was given to more than 6,500 properties containing oil and gas, more than 600 containing coal, and 100 containing other minerals. On Indian land more than 4,500 oil and gas leases were supervised, in addition to more than 200 properties containing coal, asbestos, lead, and zinc. Minerals produced during the year from public and Indian lands and naval petroleum reserves under supervision of the Geological Survey had an estimated value of \$80,000,000, and revenue received by the Government as a result of this production amounted to about \$8,000,000.

GEOLOGIC BRANCH

GENERAL STUDIES

The projects in the various States, outlined on pages 44-50, illustrate the diversity and scope of the Geologic Branch's program. This program has been planned not only to aid in the solution of immediate economic problems but also to contribute to the more substantial foundation on which the future development of the country must be built. Although our Nation is richly endowed with natural resources, we have reached the stage at which sober thought must be given to their continued availability. During our unparalleled growth easily discovered resources were exploited and exhausted to such an extent that careful planning is becoming increasingly essential. Many of our leading producers are alive to the situation, but it is difficult

to appreciate the value of broad fundamental geologic work until the need for its practical application becomes urgent. Exploration for new, concealed deposits is becoming increasingly dependent upon a sound understanding of fundamental principles of geology. The same is true of broad plans for conservation and industrial development. For this reason the Geologic Branch has been pursuing regional investigations as well as detailed surveys and periodic resurveys of mineral districts. This program has been carried on by a closely coordinated group of specialists in each branch of geology, including mineralogy, petrography, and paleontology, and in related branches of chemistry, physics, and geophysics.

During 1940, as in previous years, these specialists not only carried out specific assignments but continued to develop and improve field and laboratory methods and new apparatus and, as time permitted, conducted research investigations of fundamental character. The laboratory work not only contributed to the solution of practical problems in geology but led to the discovery of another commercial deposit of bleaching clay, essential to the petroleum industry.

An outstanding feature of the 1940 program was a continuation of the intensive study of strategic mineral deposits begun in 1939 under the auspices of the Public Works Administration. This program, which is expected to continue for 4 years, was supported in 1940 by a special fund of \$150,000. During 1940 thirty-four projects were undertaken, some regional or reconnaissance in scope but most of them detailed studies leading to estimates of the quantities and grades of ore that could be mined under varying economic conditions. Two-thirds of these investigations were completed, and before the end of the fiscal year 4 reports on them were in press, and 14 more had been submitted for critical review and editing. Encouraging results of the work thus far justify the conclusion that the United States could supply its own needs for quicksilver and tungsten, if imports were suspended, and could greatly increase its contribution of manganese and antimony.

Other noteworthy accomplishments were the completion of a map showing the relations of mineral veins to regional geologic structure in the Ouray-Red Mountain-Telluride district, Colorado, which will serve as a basis for estimating future productivity in the region; completion of a detailed survey of the oil and gas resources of the Osage Indian Reservation, which points the way to future exploration and development; completion of a survey of the classic Henry Mountains and vicinity, which throws new light on the complex igneous geology and appraises the mineral resources of the region; completion of oil and gas maps of the United States and of Kansas, Louisiana, Oklahoma, and Texas; revision of a map showing coal fields of the United

States; completion of reports on the scenery of Florida as interpreted by a geologist and on the geology and geography of Zion National Park; contributions to a tectonic map of the United States sponsored by the National Research Council and to a volume on the structural control of ore deposits, also sponsored by the Council; completion of a survey of the geology, phosphate, and coal resources of the Afton quadrangle in Wyoming; studies of geologic factors affecting flood control in Massachusetts; completion of report on origin of coal, a critical review of the progress and conclusions given in literature on the subject, for publication by the National Research Council; and preparation and transmittal of two reports on the outstanding features of oil-field development and petroleum geology in this country—one for the period 1934–38 and the other for the year 1939—for use of the Petroleum Investigation Subcommittee of the Committee on Interstate and Foreign Commerce, House of Representatives, which supplement a report on the geology and occurrence of petroleum in the United States prepared for hearings of a similar committee of the House of Representatives, Seventy-third Congress, on House Resolution 441.

Work was continued in the classic areas of the Big Horn Basin, Wyo., the Permian basin of West Texas, the Death Valley region and the Sierra Nevada, where additional evidence was obtained on recent (post-Pleistocene) glaciation and the age of Owens Lake.

The Section of Chemistry and Physics, besides its regular analytical and advisory work for the geologic staff, continued research work on analytical methods, on the origin of quicksilver minerals, the thermal dehydration of clay and other minerals, the composition and physical properties of certain rare minerals, the mineral composition of saline deposits, the gases in hot springs, the physical constants of rocks and minerals, and the correlation of thermal gradients in the earth with heat effects caused by the radioactive disintegration of various elements.

The Section of Geophysics continued work on the design and construction of geophysical instruments, computation of magnetic scales, tables, and charts, preparation of geophysical abstracts, and cooperation with the Bureau of Mines in the study of seismic vibrations caused by quarry blasts. Several bulletins on geophysical abstracts and a paper on the use of scales in evaluating magnetic anomalies were submitted for Survey publication.

General paleontologic and stratigraphic investigations were in progress on Cenozoic echinoids of the eastern United States, the Foraminifera of the Gulf coastal region, the foraminiferal family Buliminidae and the family Globigerinidae, Eocene Foraminifera from submarine cores off the eastern coast of North America, Carboniferous crinoids, diatoms, and Fusulinidae.

Services rendered by the Survey to other Federal agencies included expert advice to the Army and Navy Munitions Board, the Advisory Commission to the Council of National Defense, and the Joint Committee to Investigate the Adequacy and Use of Phosphate Resources of the United States; examinations of tunnel and dam sites and foundations for the Bureau of Reclamation; investigations of mining claims and mineral deposits and geology for the National Park Service; studies of erosion and deposition along ocean shore lines for the Army engineers and the Department of Justice; studies of geologic factors that may affect the death rate from tuberculosis for the Public Health Service; and preparation and microscopic examination of thin sections of rocks and construction of apparatus in the geophysical shop for the Bureau of Mines.

The Survey also took a very active part in the International Geophysical Congress held in September 1939 and in the activities of the International Glacier Commission, and its members, as usual, were active in the affairs of scientific societies in the United States.

WORK OF THE YEAR, BY STATES

Alabama.—Geologic mapping was carried on in the Epes quadrangle, Sumter County, and work was done on the upper Eocene, the Vicksburg, the lower Claiborne, the Tallahatta, the Upper Cretaceous, and the Carboniferous formations and on Midway and lower Oligocene Foraminifera of the State. A paper on problems in the geology of the Coastal Plain of Alabama, for publication by the State of Alabama, and a review of the Upper Cretaceous of Alabama, for incorporation by the State in a report on the subject by the Alabama Geological Survey, were submitted. A paper on the molluscan fauna of the Chickasawhay formation, Alabama and Mississippi, was published in the *Journal of Paleontology*. Work on comprehensive reports on the iron ore in the Red Mountain formation of northeastern Alabama, where field work was continued in the Greasy Cove area, and on the brown iron ore of the Russellville district was continued. A paper was submitted to the State on the cement industry in Alabama.

Arizona.—Projects on the geology and mineral resources of the Benson, Pearce, and Tucson quadrangles and on manganese deposits in the Artillery Peak Mountains were continued. Quicksilver districts in Arizona were examined in connection with the strategic minerals program. Work in the St. George region and on the Hurricane fault is mentioned under Utah. A report on the mining claims of the Hearst Estate, Inc., in Grand Canyon National Park, was made for National Park Service.

Arkansas.—Reports on manganese carbonate in the Batesville district and on the geology of the Fort Smith district have been transmitted for official publication.

California.—Field study was continued of the Santa Maria oil district, Santa Barbara County, and geophysical studies by resistivity magnetometer methods were made in the Newton placer-mining district, near Quincy. The following projects were continued: Monterey formation and the origin of its siliceous rocks; Foraminifera of Kreyenhagen shale of Garza Creek; areal and structural studies

in Death Valley region and San Andreas rift area; geomorphology of San Joaquin Basin; subsurface and economic phases of the Kettleman Hills oil field; the Mother Lode; and glacial deposits in relation to fault scarps at the east front of the Sierra Nevada. A report on the geology and paleontology of the Palos Verdes Hills was transmitted for Survey publication, and one on the geology and paleontology of Reef Ridge is practically completed. Collection of well-record data and correlation of samples from oil wells, particularly from the Los Angeles Basin, were continued, in cooperation with the American Institute of Petroleum Engineers, in connection with a general study of source beds of petroleum. Strategic-minerals investigations consisted of studies of quicksilver in San Simeon and Adelaide quadrangles, San Luis Obispo County, in Mount Diablo district, Contra Costa County, in Mayacmas and Sulphur Bank districts, Lake County, and in the Santa Inez and Los Prietos mines, Santa Barbara County; of tungsten in the Atolia district, San Bernardino and Kern Counties, and in the Bishop and other areas, Inyo and Mono Counties; of antimony in Wildrose Canyon, Inyo County, and reconnaissance of deposits in San Bernardino and Kern Counties; and of chromite in the vicinity of San Luis Obispo and the Pilliken chromite deposits in western Eldorado County. A preliminary report on quicksilver in Lake County was transmitted for Survey publication. Preliminary reports on the Mount Diablo quicksilver deposit and on the tungsten deposits in the Tungsten Hills, Inyo County, have been completed, and one on quicksilver deposits of San Luis Obispo and southwestern Monterey Counties is in preparation. A preliminary report on the Pilliken chromite deposits was transmitted, and one on chromite in Seiad quadrangle, Siskiyou County, is in press.

Colorado.—Continued cooperation with the Colorado State Board and the Colorado Metal Mining Fund included investigations in metal-mining districts of Ouray, Red Mountain, Sneffels, Telluride, and La Plata in the San Juan region, and Cripple Creek, Gold Hill, and St. Kevin; in placer districts on Tarryall and Beaver Creeks and South Platte River in Park County; and investigations of vanadium and uranium in Paradox Valley. Work was begun in the upper Arkansas Valley in the vicinity of Leadville, in the tungsten belt of Boulder County, and in the northern part of the Mosquito Range in the vicinity of Fairplay. Progress was made on reports on the geology and ore deposits of Front Range, and the Nederland tungsten, Jamestown, and Leadville districts. A preliminary geologic map of Telluride-Red Mountain-Sneffels area and a report on tungsten deposits of Boulder County were completed for Survey publication, and preliminary reports on the Gold Hill mining district, Boulder County, and on placer and lode deposits in the area drained by Beaver and Tarryall Creeks were prepared for the Colorado Scientific Society. Reports on structural control of ore deposits in the Front Range, on structural control of ore deposits in the Aiba and other districts, and on physical factors in localization of ore deposits were prepared for publication in a volume sponsored by the National Research Council. Papers on the genesis of the tungsten ores, on zonal mineralization and silicification in the Horseshoe and Sacramento districts, and on radioactive cerite near Jamestown were submitted for outside publication. Paleontologic and stratigraphic studies were made of the Cretaceous and Tertiary boundary in the Rocky Mountain region, field mapping of the Cretaceous and "Paleocene" was begun in southwestern Colorado, and a magnetometer survey was made of the Cripple Creek district. Reports on the Permian in parts of the Rocky Mountain and Colorado Plateaus, on the petrology and stratigraphy of the La Plata formation, and on the Jurassic stratigraphy of Colorado, Utah, and New Mexico are in preparation. A report on geology of

dam sites on the Green and Yampa Rivers, Utah and Colorado, was made for the Bureau of Reclamation.

Florida.—Further field work in cooperation with the Florida Geological Survey was done in the eastern part of the peninsula in connection with the revision of the geologic map of Florida and a report on the geology of the State. A paper entitled "The scenery of Florida as interpreted by a geologist" was submitted to the State for publication. Further studies were made of the Alum Bluff group, of the Tertiary stratigraphy, and on a magnetic survey of the peninsula. A report on phosphate reserves of Florida was completed for Survey publication.

Georgia.—Study of Cartersville region was continued and brief examination made of bauxite deposits in Stewart County. Papers were prepared on structure and ore deposits at Cartersville, for the American Institute of Mining and Metallurgical Engineers, and on localization of Georgia gold, for inclusion in a book on ore localization.

Idaho.—In continued cooperation with the Idaho Bureau of Mines and Geology, geologic field studies, for which reports are under way, were conducted in the Seven Devils area; in the Riggins and Meadows quadrangles, with special reference to placers; and in the Ione and Blue Wing tungsten districts, Lemhi County. Work was done on reports on the Rocky Bar district, the Boise Basin, and the geology of quicksilver deposits near Weiser. A report on faulting in western Idaho and its relation to high placer deposits was completed for Survey publication. Papers on geology and metalliferous deposits of Kootenai County and on gold placers of Secesh Basin, Idaho County, were submitted to the State; on observations of the rate of creep in Idaho, to the American Journal of Science; and on bedding vein deposits near Murray and structural control of ore deposits at Boise Basin, to the American Institute of Mining Engineers. In the search for strategic and critical minerals a detailed study was made of the antimony deposits in the Yellow Pine district, a preliminary report on which is practically completed. Noncooperative projects consisted of detailed examinations of the Irwin and Afton quadrangles. Work was resumed on general reports on the geology of the Paradise Valley and Ammon quadrangles. Work in the Teton Basin and in the Afton quadrangle is mentioned under Wyoming, and on glacial geology and physiography under Montana.

Illinois.—The report on lower Pennsylvanian floras of Illinois and adjacent States, begun by the late David White, was revised and transmitted to the State Geological Survey Division for publication.

Kansas.—Cooperation with the State during the year consisted of a study of subsurface features of the Forest City Basin. The report on the subsurface Mississippian rocks of Kansas, giving the results of former cooperative studies, was transmitted to the State. Brief descriptive texts on Mississippian rocks in Linn and Montgomery Counties were submitted to the State for printing on the backs of maps of these counties. A paper on Mississippian limestone of central and eastern Kansas has been prepared for inclusion in an article on the stratigraphy of Kansas for a special Kansas issue of the Oil and Gas Journal. The oil and gas map of Kansas was completed. Lead and zinc in the tri-State area is mentioned under Missouri.

Maryland.—Floras of the Pocono and Price formations are mentioned under Pennsylvania.

Massachusetts.—Geologic work in cooperation with the Commonwealth of Massachusetts, Department of Public Works, comprised continuation of de-

tailed mapping in the Lowell and Blue Hills quadrangles and in parts of the Norwood, Belchertown, and Milford quadrangles, a study of the glacial deposits and general geologic features of Cape Cod, and geologic work in various sections of the State in relation to highway construction and flood control. The following reports were transmitted to the Massachusetts Department of Public Works: Geology of the coast line between Point Gammon and Monomoy Point on Cape Cod; Occurrence of diabase in Dunstable and Tyngsboro at Lowell; and the occurrence of gravel in the Granville quadrangle. Reports on geology of flood areas in parts of Massachusetts and Vermont, on geologic features of the Connecticut Valley as related to recent floods, and on seismic surveys on bedrock near Lowell are nearing completion, and one on the origin of the Chelmsford granite is in preparation.

Mississippi.—Studies of the stratigraphy and structure of the Jackson area in the Raymond, Jackson, Florence, and Pellahatchie quadrangles and of the gastropods of the Vicksburg group and of the molluscan fauna of the Chickasawhay formation of Mississippi and Alabama were in progress, and one on the stratigraphy of Upper Cretaceous deposits of Mississippi was completed and a report thereon transmitted to the Mississippi Geological Survey.

Montana.—The following studies were continued: Coal resources of Otter Creek area in Rosebud and Powder River Counties; general geology and physiography of the Little Rocky Mountains, of the plains south of Bearpaw Mountains, and of the Fort Belknap Indian Reservation, including mines and mining prospects; Pliocene and Recent fault scarps in western Montana; glacial geology and physiography of western Montana; the Lance-Fort Union correlation of southeastern Montana; and fossil plants of the Fort Union and associated formations of Montana, Wyoming, and North Dakota. Magnetometer surveys were continued in the Highwood Mountain area, with special reference to the problem of locating feeders of laccoliths. Geologic mapping of the northern part of the Nye No. 2 quadrangle and studies of the geology and coal resources of an area in southern Powder River County were begun. A paper on stratigraphy of the Belt series in Libby and Trout Creek quadrangles in northwestern Montana and northern Idaho will be published by the Geological Society of America. In investigations of strategic minerals studies were made of manganese in the Philipsburg special quadrangle and the Butte district and of chromite deposits in the Stillwater area. A preliminary paper on manganese deposits at Philipsburg has been completed.

Nevada.—Projects for the study of strategic and critical minerals included tungsten deposits near Cosgrave (Mill City), Pershing County, in the Nightingale, St. Anthony, and Ragged Top districts, and in East Range, Sonoma quadrangle; quicksilver in the Bottle Creek-McDermitt areas and Buckskin Peak, Humboldt County, in the Ivanhoe district, Tobin Range, and near Vya; a reconnaissance of antimony deposits in the State; and studies of manganese deposits in the Sonoma quadrangle and near Ely. Reports are in preparation on manganese-tungsten deposits in Nevada; tungsten at Rose Creek; tungsten in the Nightingale, St. Anthony, and Ragged Top districts; tungsten deposits of northwestern Nevada; and the Majuba Hill tin mine. Preliminary reports on quicksilver of Buckskin Peak, National district, and on the quicksilver deposits of the Bottle Creek district will soon be issued by the Survey. An investigation was made of the Great Eastern nickel mine in Clark County. Projects continued were studies of general geology and ore deposits of the Eureka district and of the Hawthorne, Tonopah, Ivanpah, and Sonoma Range quadrangles; a resurvey of the Comstock lode, and resistivity and magnetic

surveys in the Austin district and in the Comstock lode. A paper on the Basin and Range province in Utah, Nevada, and California was completed.

New Mexico.—Work was continued on the reports on the geology, coal, gas, and oil resources of the eastern San Juan Basin and the Potash Mines quadrangle. A report on geology and ore deposits of the Magdalena district and a paper on transgressive and regressive Cretaceous deposits in southern San Juan Basin were submitted for Survey publication. A paper on manganese in the Little Florida Mountains and a preliminary report on tin deposits of the Black Range will be published in the bulletin *Strategic Minerals Investigations, 1940*.

New York.—Study of general geology of the Millbrook quadrangle, New York and Connecticut, was continued.

North Carolina.—In cooperation with the National Park Service a geologic map of the Blue Ridge from Adney Gap south of Roanoke, Va., to Asheville, N. C., was prepared and submitted to the Park Service. A study of the tin belt of North Carolina was continued under the strategic minerals appropriation, field work being done in the vicinity of Lincolnton and Kings Mountain. Examinations of mica and mica-feldspar mines and prospects in the Spruce Pine and Franklin districts were begun. Gossan lead is mentioned under Virginia.

Ohio.—Pennsylvanian stratigraphy is mentioned under Pennsylvania.

Oklahoma.—Areal mapping and underground studies of lead and zinc mines in the tri-State area (Oklahoma-Missouri-Kansas) were carried on, and studies were made of Mississippian faunas from the Wyandotte quadrangle (Oklahoma-Missouri) and of the stratigraphy and paleontology of the Paleozoic section at Ardmore and Sulphur. A study of subsurface geology and oil and gas resources of Osage County was continued. Progress was made on a general work on the subsurface stratigraphy and structure of Osage County and their relationships to oil and gas. Projects in the Ouachita Mountains were continued in the Black Knob area and in the area west of Potato Hills.

Oregon.—In cooperation with the Oregon Department of Geology and Mineral Industries mapping was done in the southern part of the Grants Pass quadrangle, magnetometer surveys in the Willamette Valley in the Coos Bay region were begun in connection with the location of chromite-bearing beach deposits of black sand, and a preliminary geologic map of the Medford quadrangle was issued by the State. Other projects and reports under way included the Pennsylvanian flora from central Oregon, Permian Fusulinidae from eastern Oregon, and geology and ore deposits of the Sumpter quadrangle. Work on strategic minerals included a study of chromite in the John Day and other areas in Grant County, in the Grants Pass and Kerby quadrangles, and in the vicinity of Sumpter, Granite, and Olive Lake and visits to a number of mercury districts. Reports were prepared on the eastern half of the Canyon City chromite belt of Grant County; the chromite deposits of the Briggs Creek area, Josephine County, and the Sourdough area, Curry County; and on manganese deposits in the Lake Creek district.

Pennsylvania.—Studies were in progress on regional metamorphism in lower Kittanning coal beds; on a detailed section of coal-bearing rocks across the bituminous coal basin of Pennsylvania (Appalachian coal basin); on the general geology and mineral resources of the Hanover and York quadrangles; on the floras of the Pocono and Price formations in parts of Virginia, West Virginia, Pennsylvania, and Maryland; and on stratigraphic relationships of some lower Pennsylvanian formations in Pennsylvania. Field work was continued in the Reading-Boyertown area, in cooperation with the Pennsylvania Geological Survey, and papers were prepared on physiography of the Appalachians and age and struc-

ture of the rocks of the Glenarm series for the twentieth anniversary of the Pennsylvania Survey held at Harrisburg.

South Carolina.—Investigation on tin in the vicinity of Gaffney was continued as a strategic minerals project. A paper on elliptical bays in South Carolina has been submitted to the *Journal of Geology* for publication.

South Dakota.—Examination of the cassiterite-bearing pegmatites in the vicinity of Tinton was continued, and cooperative work was done with the Bureau of Mines. A preliminary report on tin in the Tinton district is nearly completed. A geologic map of South Dakota was submitted for Survey publication.

Tennessee.—A cooperative paper on manganiferous iron ore in Perry and Lewis Counties was transmitted to the State of Tennessee for publication, and work was continued on a cooperative report on the stratigraphy and structure of the east Tennessee zinc district.

Texas.—A report on the Shafter silver district was completed for publication by the Survey. A monograph on larger invertebrate fossils of the Navarro group of Texas was submitted to the Texas Bureau of Economic Geology for publication. Investigations of the West Texas Permian, the Sierra Diablo area, and new Fusulinidae from the Cisco group in the Brazos River region were continued, and stratigraphic and faunal studies of formations in eastern Texas and the Gulf region were begun. A paper on the subsurface geology and structure of the crosscut in the Blake oil district, Brown County, was approved for publication by the American Association of Petroleum Geologists.

Utah.—The field work in the Henry Mountains was completed, the work during the year consisting of the gathering of data on petrography and structure of the intrusions, in which the party was associated with members of the Geophysical Laboratory of the Carnegie Institution. Progress was made on a report on the geology and geography of the Henry Mountains and surrounding structural basin. Field studies were continued on the Strawberry Valley-Wasatch Mountains project; studies were begun in the American Fork region of the Wasatch Mountains, and in the St. George region; and were continued on the Hurricane fault. A report on late Mesozoic and early Cenozoic history of central Utah was transmitted for publication by the Survey; reports on the geology of Zion Canyon and Bryce Canyon National Parks and on Pennsylvanian and Permian Fusulinidae from the Strawberry Valley are in progress; and work on the final detailed report on alunite deposits of the Marysvale district was continued. An examination was made of tunnel sites along the Strawberry-Green River-Great Basin divide and report thereon submitted to the Bureau of Reclamation. Three manganese districts near Castle Dale were examined under the strategic minerals program. Papers were submitted for outside publication on a new interpretation of some laccolithic mountains and its possible bearing on structural traps for oil and gas, on manganese in a thermal spring in north-central Utah, on the Hurricane fault, and on volcanic sequence in the Marysvale region, south-central Utah.

Vermont.—Detailed areal mapping of the Barre quadrangle and small parts of adjacent quadrangles was continued.

Virginia.—Work on Gossan lead was conducted in cooperation with the Virginia and North Carolina Geological Surveys, and a report on the subject is in preparation for publication by the State of Virginia. Studies were made of the stratigraphy and faunas of the Pennsylvanian strata, chiefly the Pottsville in the Flattop coal field of Virginia and West Virginia. As a part of the strategic minerals program, work was done on the manganese of Alta Vista, on the tin deposits of Irish Creek, and on a mica prospect in the vicinity of

Lynchburg. Blue Ridge Parkway studies are mentioned under North Carolina.

Washington.—Studies were continued of the manganese deposits of the Olympic area as a strategic minerals project, and a preliminary report on these investigations was prepared for outside publication. A field investigation on the oil and gas possibilities of the Forks area on the west slope of the Olympic Mountains was begun.

West Virginia.—A study of wells recently drilled in West Virginia was made in connection with the problem of deep drilling in the Appalachian Plateau. An examination of the quality and quantity of coal deposits available from the Maxwell-Tidd mine near Valley Bend was made at the request of Farm Security Administration. Studies of the Pottsville are mentioned under Virginia, and floras of Pocono and Price formations under Pennsylvania.

Wyoming.—Projects connected with geologic studies of the west side and the northeast flank of the Big Horn Basin were continued, and a magnetometer survey was made of the chromite ore bodies of Casper Mountain. Compilation of geologic map and preparation of text for report on detailed geology of Afton quadrangle and a report on geology and limnology of the Green River formation of Wyoming were continued. A report on the Teton Basin phosphate deposits was begun. Fossil plants of the Fort Union are mentioned under Montana.

ALASKAN BRANCH

Because of the special conditions prevailing in Alaska, the Alaskan Branch is organized as a distinct unit to handle all of the Geological Survey's various activities in the Territory. This arrangement has made it possible to adapt operations to the climatic, transportation, and general physical conditions and has also led to the development of special methods and techniques for the scientific and professional phases of the work. There is special need in Alaska for rapid and inexpensive exploratory surveys of large tracts of virgin country in order to block out the broader features and to differentiate the areas that appear most susceptible of development from those that do not seem to have valuable potentialities. The more promising tracts are then mapped on reconnaissance standards, which again effects selective discrimination and focuses attention on the still smaller but more important areas for which detailed surveys are needed.

The following table shows the total area surveyed topographically and geologically to December 31, 1939:

	Exploratory surveys	Reconnais- sance surveys	Detailed surveys	Total
Topographic surveys.....	84, 962	185, 586	4, 542	275, 090
Geologic surveys.....	107, 152	148, 597	4, 071	259, 820

For the areas as yet unsurveyed, approximately 300,000 square miles, it is expected that about the same percentages will hold for the near future—35 percent exploratory, 60 percent reconnaissance, and 5 percent detailed.

As the country develops, the relative proportion will change materially—detailed surveys will increase, reconnaissance surveys will decrease, and exploratory surveys will not be needed.

Although the maps and reports of the Geological Survey contain information that is practically indispensable in all enterprises concerned with the development of Alaska that call for consideration of routes of travel and transportation, sources of power and their utilization, settlements and land problems, the immediate purpose of the Survey's investigations is to determine the occurrence of valuable mineral deposits, their location, extent, volume, and characteristics. This necessitates studies of the conditions under which the mineralization took place, the factors favorable for the formation of workable deposits, the structural and other dynamic changes that may have affected the deposits after their formation, and the subsequent alterations that may have increased or lessened their value.

Already Alaska has contributed to the national wealth minerals to the value of over \$803,000,000 and each year is adding some \$25,000,000 more. Nearly a score of different mineral commodities enter into this production. In recent years the most important of these have been gold, copper, platinum metals, silver, coal, lead, tin, limestone, and antimony; in the past, marble, gypsum, barite, tungsten, chromium, and quicksilver have also been produced in significant amounts.

The field season begins in the Spring, and the money for the Survey's regular Alaskan investigations is made available immediately upon the passage of the annual appropriation act. The report for the fiscal year 1940, therefore, covers parts of two field seasons.

In both the seasons of 1939 and 1940 examinations were made, under special appropriation items, of deposits of certain so-called "strategic" minerals. In 1940 a detailed mapping project was carried on at the request of the War Department and with funds provided by that Department.

Field work.—During the field season of 1939 new geologic work was undertaken by the Alaskan Branch on Chichagof Island in southeastern Alaska; in the Gerstle and Robertson Rivers area on the northern flanks of the Alaska Range in Central Alaska; and in extreme western Seward Peninsula, near Tin City. In the Chichagof area part of the work was designed to afford detailed information as to geologic conditions in the gold-lode mines that have long been productive there, and part was aimed at tracing the geologic structures and formations northward to Yakobi Island, near the extreme northwestern tip of Chichagof Island, where deposits of nickel-bearing ores have been reported, in order to determine the probable extent and character of these potential nickel ores. The work in the Alaska Range region was a continuation of the endeavor to obtain all pertinent information regarding the prospective value of the mineral resources in this extensive tract of country. The work in Seward Peninsula was part of the regular Alaskan Branch investigations, but as it involved the

strategic mineral tin, special stress was put on obtaining quantitative data that would be useful in determining to what extent domestic supplies of tin might be available to the United States from this source.

The two topographic field projects included a survey of parts of the Alaska Range between the Chisana and Nabesna Rivers and the mapping of the Porcupine River and some of its tributaries from the Canada-Alaska boundary westward to the Yukon River.

A general purpose project was undertaken in 1939 to collect data regarding recent mining trends and developments and to obtain first-hand information that would aid in formulating plans for the future conduct of the work.

During the first part of the season of 1940 eleven principal field projects were carried on. Five of them involved geologic investigations of mineral resources, four were topographic investigations, and two were for general purposes. The new geologic projects include parts of Yakobi and Chichagof Islands in southeastern Alaska; part of the Alaska Range, including especially the section between Nabesna and Chisana Rivers; areas in western Seward Peninsula that have especial importance as possible sources for domestic supplies of tin; the southern part of Kenai Peninsula, where domestic sources of chrome ore are known to occur; and areas in the Copper River region, in the Yukon Valley near the international boundary, and places in southeastern Alaska where intensive paleontologic studies are required to aid in identifying correctly certain members of the geologic sequence and thus provide means for accurate correlations with other groups of rocks in Alaska, in the States proper, and perhaps throughout the world. The studies of the deposits of tin, nickel, and chrome are of particular importance and timeliness as these minerals are of vital importance in the nation's defense program. The four topographic projects include reconnaissance surveys of part of the valley of Holitna River, one of the large tributaries to the Kuskokwim that joins that river in about the central part of its course; the aerial photographing of an extensive tract of country, extending on the east from Nenana on the Tanana River to McGrath on the Kuskokwim River on the west, and including about midway between these points Lake Minchumina; a detailed survey of part of Annette Island in southeastern Alaska for an airplane landing field; and the filling in of gaps and the extension of former mapping in parts of the Copper River Valley and in the vicinity of Juneau. One of the two general-purpose projects of 1940 is comparable in its scope with the similar project undertaken in 1939 and described in the preceding paragraph. The other project was undertaken for the purpose of securing information required in certain phases of the current work of the branch and to make Survey reports, maps, and information more readily accessible and useful to the public.

Office work.—Much office and laboratory work was done to make the results of the field work available. This included identifying the specimens collected, completing the field sketches and drawings, and interpreting the various geologic observations. A major mapping project that did not involve field work during the season of 1939 but was carried on in the laboratories of the Geological Survey throughout the winter was the compilation of cartographic data from aerial photographs covering most of the lowland of the Tanana River from the Canada-Alaska boundary westward to about the longitude of Fairbanks, exclusive of a tract from Tanana Crossing to Delta River.

The usual annual canvass of the production of minerals from the Territory was made, including the analysis and tabulation of returns from mine operators throughout the Territory and the checking of these results with information

from other sources in order to show the amount of each kind of mineral produced, the districts from which it came, and the new developments that have taken place or are in prospect. This work has been completed for the year 1939 and the results prepared for publication; the canvass for 1940 is under way.

Reports and maps.—During the year four reports containing maps, seven maps (six new editions and one reprint), and two press statements have been published. Eight reports containing maps, two new maps, and a reprint of one map are in course of publication. In addition two reports, three maps, and a reprint of one map are partly prepared. Eight papers prepared by personnel of the Alaskan Branch were approved for outside publication.

TOPOGRAPHIC BRANCH

The headquarters office of the Topographic Branch and of its Atlantic and Central divisions is located at Washington; the headquarters office of the Pacific division is at Sacramento, Calif. Section offices were maintained at Denver, Colo., Rolla, Mo., Chattanooga, Tenn., and Detroit, Mich.

GENERAL OFFICE WORK

Necessary office work incidental to the field work of the Topographic Branch consisted of the computation and adjustment of the results of control surveys, photoplanimetric compilation, and the ink-ing, inspection, and editing of the completed topographic field sheets prior to their submission for reproduction.

Section of Computing.—Computation and adjustment of the spirit leveling, transit traverse, and geodetic triangulation done for the control of current topographic mapping were continued as the routine function of the section. Readjustments of older control surveys in extended areas were completed to refer them to the standard datums of the United States.

Manuscripts containing the results of spirit leveling in Michigan and in parts of Texas, also the results of all transit traverse in Missouri, were prepared and transmitted for publication. The following bulletins were published during the year: 890-A, 890-B, Spirit leveling in South Carolina, in two parts; 898-G, 898-H, Spirit leveling in Missouri, the last of eight parts; 912, Spirit leveling in Utah; and 916-A, 916-B, 916-C, Transit traverse in Missouri, three of the eight parts.

Improved methods for computing and adjusting transit traverse were devised and put into practice.

Section of Photomapping.—Aerial photographs of which field interpretation had been made were used for the compilation, by the radial-line method, of planimetric bases of twenty-four $7\frac{1}{2}'$ quadrangles or parts of quadrangles in Louisiana, ten $7\frac{1}{2}'$ quadrangles or

parts of quadrangles in Michigan, and fifteen 15' quadrangles or parts of quadrangles in Wisconsin, covering a total of 3,595 square miles.

Line bases to assist in topographic mapping were compiled from aerial photographs by the radial-line method of part of a 15' quadrangle in Virginia-North Carolina, covering an area of 85 square miles, and of parts of three 7½' quadrangles in Michigan, covering an area of 122 square miles. Similar bases compiled from aerial photographs by use of the aerocartograph were made of part of a quadrangle in Virginia-West Virginia, covering 176 square miles, and of fifteen 7½' quadrangles or parts of quadrangles in Massachusetts and one in Rhode Island, covering an area of 680 square miles. Of the photographs used in photomapping, which covered areas totaling 22,021 square miles, those covering 7,199 square miles were purchased from commercial firms, those covering 70 square miles were hired from commercial firms, and those covering 14,752 square miles were purchased or borrowed from other Government agencies.

Section of Cartography.—Work on the United States part of the map of the world on the scale of 1:1,000,000 was continued. The compilation and inking of Sheet N J-18, Chesapeake Bay, was completed, and that of Sheet N K-16, Chicago, was in progress.

For the Public Roads Administration the preparation of the Transportation Map of the United States was continued. Compilation and inking were in progress on 78 sheets. Proofreading and checking were done on 37 sheets. Maps of 3 States, comprising 23 sheets, were published, and maps for 2 States, comprising 21 sheets, were in course of publication.

Section of Inspection and Editing.—During the year 22 new topographic maps were prepared for photolithographs as two-color advance sheets and 22 as planimetric maps; 129 new topographic maps were edited for publication, of which 102 were for multicolor lithographs and 27 for engraving; and 205 quadrangle maps, 34 State maps, and 12 State index maps were prepared and edited for reprint editions. Editing was also completed on 97 maps published as illustrations, making a total of 477 maps edited.

On June 30, maps in the process of reproduction included 181 topographic maps to be engraved, 1 two-color photolithograph, 65 multicolor photolithographs, and 20 planimetric maps. Of topographic maps to be engraved, 16 were in the process of editing, and 77 were awaiting editing. Of maps to be reproduced by multicolor lithography, 17 were in the process of editing, and 57 were awaiting editing.

For the Conservation Branch the work of preparing river surveys for publication was continued. Work was done on 23 different projects. The maps of 10 projects, comprising 48 separate sheets,

were transmitted during the year for reproduction by photolithography.

For the Tennessee Valley Authority 5 maps were prepared and transmitted for reproduction, and proofs of 10 maps were read.

MAP INFORMATION OFFICE

This office serves as a clearing house for geographic, topographic, and aerial photographic data pertaining to Federal as well as commercial mapping agencies. It maintains extensive card index files and houses a collection of sample maps of practically every type published by Government bureaus, foreign countries, and commercial mapping organizations. It is staffed and equipped to furnish expeditiously survey, map, and geographic information to Federal offices, State institutions, and to an interested public. The custodian of the Map Information Office acts also as secretary to the Federal Board of Surveys and Maps. The work of the Map Information Office, as well as that of the Board, is done entirely by Geological Survey personnel.

FIELD SURVEYS

Work was done in 46 States, in the District of Columbia, and in Puerto Rico. Cooperative projects were conducted in 14 of these States, in Puerto Rico, and with the Tennessee Valley Authority.

For the Tennessee Valley Authority, mapping within the Tennessee River Basin was continued by the use of aerial photographs and the stereophotogrammetric method. On June 30, 32 Geological Survey employees were engaged on this project.

Of the total area of the United States, 45.8 percent has been covered by topographic maps prepared by the Geological Survey.

WORK OF THE YEAR, BY STATES

Alabama.—The 7½' quadrangles Chuckbey Bay, Kushla, Silver Hill, Theodore, and Wheelerville completed and Stapleton and Rock Run and vicinity (Ala.-Ga.) begun.

Arizona.—The 15' quadrangles Chloride, Silver Reed Mountains, and Tubac completed and Palo Alto and Sunset begun.

Arkansas.—The 15' quadrangle Antoine completed. In cooperation with the Arkansas Geological Survey, the 15' quadrangle Smyrna and the 7½' quadrangles Scott Northeast, Scott Southwest, and Scott Southeast completed and Cabot Southeast begun.

California.—The 15' quadrangles Cayucos, El Cajon, Idria, Jamul, and Port San Luis and the 7½' quadrangles La Jolla Southeast and San Diego Northeast completed and the 15' quadrangle Cuyamaca begun. In cooperation with the State engineer of California, the 15' quadrangles Cape Fortunas and Rohnerville begun.

Colorado.—The 15' quadrangles Elizabeth completed and Castle Rock, Elbert, Garfield, Palmer Lake, and Pitkin begun. An extension of the Black Canyon of the Gunnison National Monument continued and the Tenmile mining district begun. In cooperation with the city of Denver, the 7½' quadrangles Box Elder, Indian Hills, Littleton, Parker, Pine Ridge, Senac Ranch, and Scranton completed.

Connecticut.—The 7½' quadrangles Essex completed and Deep River begun.

District of Columbia.—The revision of Washington and vicinity (D. C.-Md.-Va.) begun.

Florida.—The 15' quadrangles Arran and Tallahassee completed and Wetumpka begun.

Georgia.—The 15' quadrangles Adairsville, Waleska, and the Pine Log area continued. In cooperation with the Tennessee Valley Authority, the 7½' quadrangles Culberson, Gumlog, and Ivylog begun.

Idaho.—The Wallace special area completed and the 15' quadrangle Blackfoot begun.

Illinois.—The 15' quadrangles Cissna Park and Fithian completed and Rose Hill resumed. In cooperation with the Illinois Department of Registration and Education, Geological Survey, the 15' quadrangles Freeport, Ina, and Mulberry Grove completed and Carni, Forreton, Galva, Mount Carroll, and St. Elmo resumed.

Indiana.—The 7½' quadrangles Seeleyville, Marshall Southeast, and Marshall Northeast completed. In cooperation with the Indiana Department of Conservation, the 7½' quadrangles Brooksbury, Otterbein Northeast, Sullivan Northeast, Sullivan Northwest, Turkey Lake Northeast, Turkey Lake Northwest, Turkey Lake Southeast, Vevay North, and Vevay South completed and Merom Northeast, Rising Sun Southwest, Rising Sun Southeast, and Sullivan Southeast begun.

Iowa.—The 15' quadrangles Centerville (Iowa-Mo.) and Forbush completed and Seymour begun.

Kansas.—The 15' quadrangles Modoc, Sandon, and Pence and the 7½' quadrangle Sandon Northwest completed and the 15' quadrangle Terryton begun. In cooperation with the Kansas Geological Survey, the 15' quadrangle Severy and the 7½' quadrangles Sedgwick Southeast, Sedgwick Southwest, and Wichita Northwest completed and Wichita Southwest begun.

Kentucky.—The 7½' quadrangles Hico and New Concord completed and Fenton and Rushing begun.

Louisiana.—The 15' quadrangles Bayou du Large and Lake Charles completed. In cooperation with the Louisiana State Board of Engineers, planimetric maps completed for the 7½' quadrangles Arnsburg, Bossier Point, Cannisnia Lake, Elm Grove, Forbing, Heflin, Kingston, Koran, Mansfield, Naborton, Nicholson Northeast, Nicholson Northwest, Nicholson Southwest, Nicholson Southeast, Ringgold, Varnado Northeast, Varnado Northwest, Varnado Southwest, Varnado Southeast, and Wallace Lake and the 15' quadrangle Franklinton begun.

Maine.—The 15' quadrangles Amity and Danforth completed. In cooperation with the Maine Public Utilities Commission, the 15' quadrangles Oquossoc and Sebec begun.

Maryland.—The 15' quadrangles Elkton (Md.-Del.-Pa.) and Havre de Grace (Md.-Pa.) completed.

Massachusetts.—The 7½' quadrangles Attleboro (Mass.-R. I.), East Providence (Mass.-R. I.), and Westport completed. In cooperation with the Massachusetts Department of Public Works, Division of Waterways, the 7½' quadrangles Belchertown, Billerica, Brewster, Chatham, Dennis, Harwick, Lowell, Monomoy Point,

Shutesbury, Tyngsboro, and Westford completed and Concord, Framingham, Maynard, Natick, and Orleans begun.

Michigan.—The 15' quadrangles Dundee and Blissfield and the 7½' quadrangle Rattle Run completed and the 7½' quadrangle Ypsilanti East begun. In cooperation with the Michigan Highway Department, the 7½' quadrangles Dearborn, Estral Beach, Inkster, Redford, and Royal Oak completed and Flat Rock, Monroe, Stony Point, Wayne County Airport, and Wyandotte begun. In cooperation with the Michigan Department of Conservation, planimetric maps for the 7½' quadrangles Carvers Gap, Graveraet River, Laurium, Point Mills, Red Ridge, Rice Lake, and Traverse Island completed and for the 15' quadrangles Houghton and Winona begun.

Minnesota.—The 15' quadrangles Drayton (Minn.-N. Dak.), Hallock, Kennedy, and Pembina (Minn.-N. Dak.) completed.

Mississippi.—The 15' quadrangles Oxford completed and Denmark continued.

Missouri.—The 15' quadrangles Acorn, Farragut (Mo.-Iowa), and Hamburg (Mo.-Iowa) completed and Coin (Mo.-Iowa) begun. In cooperation with the Missouri Geological Survey and Water Resources, the 15' quadrangles Blockton (Mo.-Iowa), Bolckow, Brussels (Mo.-Ill.), Long Lane, Mineola, Noel, Protom, Skidmore, Stansberry, and Wellsville and the 7½' quadrangles Dederick, Deerfield (Mo.-Kans.), Harwood, Humansville, Hume Southeast (Mo.-Kans.), Moundsville, Richards (Mo.-Kans.), and Sprague completed, the 15' quadrangle Gentry continued, the 15' quadrangles Mountain, Salem, and Stone Hill resumed, and the 15' quadrangles Bedford, Florida, Marshall, Maryville, and Parnell and the 7½' quadrangles Iconium, Lowry City and Weaubleau begun.

Montana.—The 15' quadrangles Nye Northwest and Sunburst completed and Mount Cowen Northwest and Mount Douglas begun.

Nebraska.—The 15' quadrangle Red Cloud and Republican River, sheets Nos. 8, 9, 10, 11, 12, 13, 14, and 15 completed.

Nevada.—The 15' quadrangles Cosgrave and Owyhee completed and Antler Peak begun.

New Jersey.—The 7½' quadrangles Bridgeport (N. J.-Pa.), New Brunswick, and Nyack (N. Y.-N. J.) completed.

New Mexico.—The 15' quadrangles La Ventana, Queen Northeast, and Queen Southeast completed, Nacimiento Peak continued, and Tererro begun.

New York.—The 15' quadrangles Plattsburg (N. Y.-Vt.), Rouses Point (N. Y.-Vt.), and Willsboro (N. Y.-Vt.) completed. In cooperation with the New York Department of Public Works, the 7½' quadrangles Syracuse completed and Brewerton and Cicero begun.

North Carolina.—The 15' quadrangles Raleigh completed, Durham South begun, and Cape Hatteras National Park continued. In cooperation with the Tennessee Valley Authority, the 7½' quadrangles Alarka, Bryson, Bunches Bald, Clyde, Cove Creek Gap, Delwood, Fontana, Greens Creek, Hepco, Hewitt, Ivylog, Judson, Proctor, Ravenford, Robbinsville, Santeetlah Creek, Tapoco (N. C.-Tenn.), Wesser, and Whittier completed and Canton and Sandymush begun.

North Dakota.—The 15' quadrangles Bathgate, Cavalier, Drayton (N. Dak.-Minn.), Glasston, Pembina (N. Dak.-Minn.), and Selz completed.

Oklahoma.—The 15' quadrangles Geary and Red Oak completed and the 7½' quadrangles El Reno Southwest and El Reno Southeast begun.

Oregon.—The 15' quadrangles Cape Foulweather and Yaquina completed and Canyon City Northeast, Canyon City Northwest, Izee Northeast, and Izee Northwest begun.

Pennsylvania.—The 7½' quadrangle Lansdowne completed. In cooperation with the Pennsylvania Department of Internal Affairs, Topographic and Geologic Survey, the 15' quadrangles Orbisonia and Sayre completed, the Brockwayville begun, and the cultural revision for the 15' quadrangles Curwensville, Houtzdale, and Philipsburg completed.

Puerto Rico.—In cooperation with the Commissioner of the Puerto Rico Department of the Interior, the 7½' quadrangles Bayamon, Carolina, Hormigueros, Rio Grande, and San Juan completed and Arecibo, Barceloneta, Manati, and Vega Alta begun.

Rhode Island.—The 7½' quadrangles Bristol, Newport, and Prudence Island completed.

South Carolina.—The 15' quadrangles Florence and Timmons ville completed and Marion begun.

South Dakota.—The 15' quadrangles Crow Lake, Lyonville, and Tinton and vicinity (S. Dak.-Wyo.) completed and the 15' quadrangle Iona begun.

Tennessee.—The 7½' quadrangles Baileyton, Bearden, Cave Creek, Concord, Hartford, Jones Cove, Knoxville, Lemon Gap (Tenn.-N. C.), Louisville, Lovell, Maryville, Neddy Mountain, Philadelphia, Pigeon Forge, Richardson Cove, Shooks Gap, Walden Creek, Waterville (Tenn.-N. C.), and Wildwood completed and Blockhouse begun. In cooperation with the Tennessee Valley Authority, the 7½' quadrangles Bacon Gap, Bethel Valley, Binfield, Boyd Creek, Calderwood, Cartertown, Cedar Creek, Chattanooga, Chattanooga East, Elverton, Gatlinburg, John Sevier, Johnson City, Kykers Ferry, Lake Davy Crockett, Lenoir City, Loudon, Meadow, Newport, Parrottsville, Pattie Gap, Rockwood, Spring City, Ten Mile, and Wear Cove completed and Carters Creek, Godwin, Hariman, Kinzel Springs, Madisonville, Ooltewah, Tallassee, and Venore begun.

Texas.—The 15' quadrangles Big Spring North and Borego Tank completed.

Utah.—The 15' quadrangle Soldier Summit completed.

Vermont.—The 15' quadrangles Plattsburg (N. Y.-Vt.), Rouses Point (N. Y.-Vt.), and Willsboro (N. Y.-Vt.) completed and Plainfield begun.

Virginia.—The 15' quadrangles Lake Drummond (Va.-N. C.) and Moyock (Va.-N. C.) completed and Back Bay (Va.-N. C.) begun. In cooperation with the Virginia Conservation Commission, the 15' quadrangles Berryville (Va.-W. Va.), Hightown (Va.-W. Va.), and Rustburg completed, Clarksville continued, and Orkney Springs (W. Va.-Va.) begun.

Washington.—The 15' quadrangle Mount Spokane (Wash.-Idaho) completed. In cooperation with the Director of the Washington Department of Conservation and Development, the 15' quadrangles Boylston and Reardan Northeast completed and Reardan Southeast begun.

Wisconsin.—The 15' quadrangles Maiden Rock (Wis.-Minn.) and Menomonie completed. In cooperation with the Wisconsin Highway Commission, planimetric maps for the 15' quadrangles Cassian, Dunbar, Florence, Goodman, Iron Mountain, Iron River, Laona, Long Lake, Norway, and Pembine completed, for Pike Lake continued, and for Brantwood, Monico, and Rhinelander begun.

Wyoming.—The 30' quadrangle Big Piney and Fossil special completed and Superior mining district begun.

WATER RESOURCES BRANCH

Comprehensive information concerning the quantity, chemical quality, and availability of both surface and ground waters becomes more important each year. The growth of the country, with con-

sequent increases in uses of water for many and varied purposes, and the recent widespread and disastrous droughts and floods have emphasized the dependence of the physical and economic well-being of the Nation upon use and control of water. The Water Resources Branch collects and publishes data that are prerequisite for orderly and wise development of domestic, municipal, and industrial water supplies; for irrigation and navigation projects; and for flood protection, recreational uses, air conditioning, wild-life conservation, water-power development, and measures for control of pollution. Expansions of many industrial activities in connection with preparations for National defense will present additional problems in water supplies, which should be anticipated and provided for in advance of the time of actual need.

The appropriation for stream gaging for 1940 provided \$1,143,000 for the investigation of water resources. Of that amount, \$900,000 was available only for cooperation with States or municipalities. As set forth below, the collection and compilation of water data are carried on in cooperation with Federal bureaus, States, and municipalities, and with permittees and licensees of the Federal Power Commission. The aggregate expenditures during the year exceeded \$3,000,000.

Federal bureaus.—Investigations were conducted for the following Federal bureaus, which made available nearly \$1,000,000 to cover the cost: The Mississippi River Commission and the Office of the Chief of Engineers, War Department; the Tennessee Valley Authority; the Flood Control Coordinating Committee, the Soil Conservation Service, and the Weather Bureau, Department of Agriculture; the Bureau of Biological Survey, the Bureau of Reclamation, the Grazing Service, the Division of Territories and Island Possessions, the National Park Service, and the Office of Indian Affairs, Department of the Interior; the Bureau of Prisons, Department of Justice; the Department of State; the Federal Power Commission; and the National Resources Planning Board.

States.—The total amount contributed by States and municipalities for cooperative water-resources investigations was approximately \$953,000. Additional data and records furnished by private organizations and individuals had an estimated value of \$245,000.

Permittees and licensees of the Federal Power Commission.—At the request of the Federal Power Commission, 29 engineers of the Branch have been designated as representatives of the Commission in the conduct of such field work as may be assigned to them by the Commission. These engineers have supervised the operation of 168 projects under permits and licenses of the Commission. About 293 gaging stations were operated by the Branch or by permittees and licensees

under the supervision of the Branch in connection with 125 projects of the Commission. The permittees and licensees furnished about \$76,000 for this work.

Division of Surface Water.—The Division of Surface Water, functioning through 37 district offices, was engaged primarily in the collection of daily records of stream flow at river-measurement stations, of which 3,910 were in operation at the end of the year in all the States except Delaware, in the District of Columbia, and in Hawaii. Records of stages only were obtained at 27 additional river stations, and records of flow were obtained at 435 gaging stations on canals and ditches. Records of stages were obtained at 389 stations on lakes and reservoirs where information regarding water storage and water utilization was of particular value. On June 30, 4,761 gaging stations were in operation, 3,534 of which were equipped with water-stage recorders. Records for 144 additional gaging stations were received from Federal bureaus and from individuals. A total of 60,627 discharge measurements were made at gaging stations, and 5,351 miscellaneous discharge measurements were made at other places. In this work, 45 States, the Territory of Hawaii, and several Federal bureaus cooperated.

Fifteen reports containing records of the flow of streams in various sections of the United States and in Hawaii were completed for publication as water-supply papers. Thirty-one technical papers relating to surface water were prepared.

An expanded program of construction and operation of river-measurement stations was carried on during the year in cooperation with the Office of the Chief of Engineers, War Department, in connection with its flood-control investigations and the maintenance and improvement of existing river and harbor works. A new program of lesser magnitude was started in cooperation with the Flood Control Coordinating Committee of the Department of Agriculture. Both programs are to be continued during the 1941 fiscal year.

Designs of artificial-control structures for stabilizing stage-discharge relations at river-measurement stations were tested at the National Hydraulic Laboratory of the National Bureau of Standards. Tests were made of one-sixth scale models for the purpose of extending to higher heads and greater depths of water the findings previously obtained with full-size models. Tests were also made of structures designed for use as artificial controls in streams that have shifting beds and that carry large quantities of debris at flood stages. Laboratory determinations of stage-discharge relations for two gaging stations at which it was impracticable to obtain current-meter measurements at high stages were used to supplement the results of measurements made in the field.

Studies were made in the National Hydraulic Laboratory to ascertain the position that should be taken by the engineer in making discharge measurements by wading, in order to avoid or minimize the possibility of affecting the velocity of the water passing the current meter. Similar investigations were made at gaging stations on several rivers in New Jersey as an extension of the laboratory studies to field conditions. These research investigations will lead to improvements in methods of field work, with a resulting increase in accuracy and efficiency of operation.

Division of Ground Water.—The Division of Ground Water investigates the waters that lie below the surface in the zone of saturation, from which wells and springs are supplied; the source, occurrence, quantity, and head of these waters; their conservation; their availability and adequacy for domestic, industrial, irrigation, and public supplies and as watering places for livestock and desert travelers; and the methods of constructing wells and recovering water from them and of improving springs. The constantly increasing use of water supplies from wells is causing a greater demand each year for intensive studies of the quantities of ground water that are perennially available.

During the year about 85 technical reports or papers relating to ground water were released to the public, and 28 technical papers were presented by members of the Division before scientific societies or other organizations.

Periodic measurements of water levels or artesian pressure were made in about 5,500 observation wells, on about 265 of which recording gages were maintained. The report on water levels and artesian pressure in observation wells in the calendar year 1938 was published as Water-Supply Paper 845, and a similar report for 1939 is in press as Water-Supply Paper 886. Tests on 44 water-bearing materials were made in the hydrologic laboratory.

Work was done in 38 States and in Hawaii and the District of Columbia, nearly all in cooperation with Federal, State, Territorial, or local governmental agencies.

WORK OF THE YEAR, BY STATES

In Alabama an investigation of ground water was begun in the Cretaceous area of the Coastal Plain. In Arizona investigations were begun, chiefly in the Gila River Basin. A report on ground-water recharge from floodwaters of Queen Creek was released to the United States Army engineers. In Arkansas studies were continued in the Grand Prairie region, and a report was made to the State geologist on the water-well survey of the Work Projects Administration. In California an investigation was begun in the coastal area of Orange and Los Angeles Counties, and water levels were measured in observa-

tion wells in several areas. A report on the geology and ground-water hydrology of the Mokelumne area, California, was published as Water-Supply Paper 780. In Colorado investigations and reports were made on prospective well sites on the public lands in the western part of the State. In Connecticut work was continued on water levels in observation wells, and reports were prepared on the New Haven area and on the area in the vicinity of the Federal Correctional Institution at Danbury. In the District of Columbia a survey was made of ground-water pumpage, and periodic measurements were started on several observation wells. In Florida investigations were continued in the Jacksonville area; work was started in the Miami and Pensacola areas; and a summary on ground-water resources of the Pensacola area was released. In Georgia investigations were continued in the Savannah area and other parts of the Coastal Plain, and a report was released on the artesian water in the coastal area. In Hawaii work was continued on several of the islands; the geophysical phases of the studies were completed; and several papers on ground water were released.

In Idaho periodic measurements of water levels were made in several observation wells. In Indiana work was continued in the Indianapolis area and on the State-wide observation-well program. In Iowa work was continued on State-wide ground-water studies and on a study of the effects of soil conservation on ground-water levels in the Tarkio Basin. In Kansas work was continued in the Wichita and other areas; a large program of new work was started in the western part of the State; and several papers relating to ground water were released. In Louisiana investigations were continued, chiefly in Grant, LaSalle, Acadia, and Jefferson Davis Parishes. Several papers on ground water were released, and a report on the ground-water resources of Rapides Parish was published by the State Geological Survey as Bulletin 17. In Maryland periodic measurements were made of water levels in several observation wells. In Massachusetts work was continued on a small scale on ground-water studies and measurements of observation wells. In Michigan work was continued on the observation-well program. In Mississippi work was continued in the alluvial plain of the Mississippi Valley and in the coastal area. In Missouri water levels were measured in several wells in the Tarkio Basin. In Montana the observation-well program was continued on the lowlands at the head of Flathead Lake. In Nebraska work was continued on State-wide investigations, and several reports were released. In Nevada a brief investigation and a report were made on the Ruby Valley. In New Jersey observations and studies were continued in several areas. In New Mexico studies were continued in the principal ground-water areas, and 6 reports were published by the State Engineer. In New York observations and studies were continued on Long Island. In North Carolina a study of methods of developing wells was continued at Elizabeth City, also the program of water-level measurements in wells in different parts of the State. In North Dakota the observation-well program was continued, and work was begun in the Fargo and other areas. In Ohio work was continued in Hamilton and Butler Counties, in the Cincinnati area, and a report on the area was released. In Oklahoma work was continued, chiefly in the Panhandle, and several reports were released. The report on the geology and ground-water resources of Texas County was published by the State Geological Survey as Bulletin 59. In Oregon work was continued in different areas, and several reports were released to the United States Army engineers. A report on the geology and ground-water resources of the Harney Basin was published as Water-Supply Paper 841.

In Pennsylvania the observation-well program was continued, and a report on ground water in north-central Pennsylvania was published by the State Topographic and Geologic Survey as Bulletin W 6. In South Carolina studies were continued on the ground-water levels in the Tiger River area. In South Dakota work was begun on a program of observation wells. In Tennessee records were obtained of the current pumpage and water levels in observation wells in Memphis. In Texas work was continued in many areas, new work was begun in the Pecos River Basin, and a number of ground-water reports were released. Records of wells and springs in 20 counties were mimeographed by the Work Projects Administration. In Utah a State-wide observation-well program and studies in the Cedar City area were continued, and several reports were released. A report on artesian water levels and interference between artesian wells in the vicinity of Lehi was published as Water-Supply Paper 836-C. In the Virgin Islands a report was in preparation on the Island of St. Croix. In Virginia work was continued in the southern part of the Coastal Plain. In Washington studies were continued on a State-wide program and in the Tacoma and Bremerton areas. In Wisconsin records were obtained of water levels in several observation wells.

Division of Quality of Water.—The Division of Quality of Water analyzes water from surface and underground sources with reference to its suitability for industrial and agricultural uses and for domestic use (not related to questions of health) so far as such use is affected by the dissolved mineral matter. During the year, analyses were made in Washington of 2,255 samples of water from surface and underground sources. The analyses included many made for cooperative studies of ground water in the different States and for special investigations of water supplies for specific projects. During the year, 10,921 samples were examined by or under the technical supervision of the Division of Quality of Water in field laboratories at Miami, Fla., Roswell, N. Mex. (substation at Albuquerque), and Austin and Pecos, Tex. At Boise, Idaho, the silt content was determined for 32,471 samples from the Boise River and its tributaries. The silt content of 7,850 samples from streams in or near projects of the Soil Conservation Service of the Department of Agriculture was determined in field laboratories at Shenandoah, Iowa (Tarkio, Mo., project), High Point, N. C., Pullman, Wash., and LaCrosse, Wis.

Studies of suspended and dissolved matter of the Colorado River and its tributaries were continued. Tables of analytical data for Colorado River gaging stations at which samples were collected through the water year 1938-39 (Grand Canyon and Willow Beach gaging stations for part of the 1940 water year) were filed with the Survey offices at Denver, Colo., Los Angeles, Calif., Salt Lake City, Utah, San Francisco, Calif., and Tucson, Ariz. Tabulations of analyses of samples from different depths at several points in Lake Mead were furnished to the Bureau of Reclamation. An intensive study of the chemical character of the water of the Pecos River in New Mexico, which was begun in cooperation with the State Engineer

of New Mexico in 1937, was continued as a part of the joint investigation of the Pecos River Basin under the auspices of the National Resources Planning Committee and was extended to cover the part of the river basin in Texas. Field studies were made of the sources of saline water in the basin. Analyses of composites of daily samples of surface water and analyses of single samples of surface water and of ground water were tabulated and made currently available at the laboratories in Roswell, N. Mex., and Pecos, Tex., where the analyses were made.

Tables of records of precipitation, discharge, and suspended matter at gaging stations on four demonstration projects of the Soil Conservation Service, Department of Agriculture, for the year ending September 30, 1939, were released to the Soil Conservation Service. Studies of silt movement in streams in the Boise River Basin in Idaho and in the St. Francis River Basin in Missouri were made for the Flood Control Coordinating Committee of the Department of Agriculture, and preliminary reports on the measurements of discharge and suspended matter were released for the period January through September 1939 for the Boise River Basin and for the period February through September 1939 for the St. Francis River Basin.

Close cooperation was continued with the Division of Ground Water in the study of problems relating to quality of ground water and in the preparation of the parts of ground-water reports that involve consideration of the chemical character of the waters. Miscellaneous water analyses were made for the Department of Agriculture, the Department of Commerce, the Navy Department, and the Securities and Exchange Commission. The division furnished information and advice on problems relating to quality of water to the Biological Survey, the Bureau of Reclamation, and the National Park Service, of the Department of Interior; also to the Bureau of Foreign and Domestic Commerce, the Bureau of Plant Industry, the Federal Housing Administration, the Federal Trade Commission, the Food and Drug Administration, the National Bureau of Standards, the National Institute of Health, the National Resources Planning Board, the Navy Department, the Netherlands Legation, the Public Health Service, the Public Works Administration, the Reconstruction Finance Corporation, Office of the Chief of Engineers, the United States Travel Bureau, the National Geographic Society, and to numerous companies and individuals. Twelve technical papers relating to quality of waters were prepared for publication in journals or for presentation before scientific societies or other organizations.

Division of Water Utilization.—The Division of Water Utilization conducts hydrologic studies and compiles data relating to the utilization and control of the waters of streams. It supervises

studies of hydrologic problems made by the field personnel of the branch and serves in an advisory capacity in the administration and conduct of various water-resources investigations and related governmental activities.

The collection of stage and discharge data relating to outstanding floods and miscellaneous studies of water resources in several of the district offices of the branch were supervised and coordinated, and the work of assembling data and general information on floods was continued. Projects involving compilations of information on topographic characteristics of drainage basins that may relate to determination of flood flows were supervised. The initiation and conduct of some of these projects were sponsored by the Public Works Administration and the Work Projects Administration. Studies were made of the surface-water hydrology of the demonstration projects of the Soil Conservation Service, Department of Agriculture, in connection with the work in which the Survey has been cooperating for several years.

Methods of analyzing relationships between rainfall and run-off with a view to developing a standard method of analysis were studied in collaboration with the Office of the Chief of Engineers of the War Department and several bureaus of the Department of Agriculture. Investigations of the water problems along the international boundary between the United States and Canada have been continued for the State Department and the International Joint Commission. Numerous papers and discussions on hydrologic and hydraulic subjects were contributed to technical and scientific journals.

The following Water-Supply Papers were prepared for publication during the year, and other reports are in various stages of preparation:

843. Floods of December 1937 in northern California, by H. D. McGlashan and R. C. Briggs.

844. The floods of March 1938 in southern California, by F. C. Ebert and H. C. Troxell.

846. Natural water loss in selected drainage basins, by G. R. Williams and others.

847. Maximum discharges at stream-measurement stations through December 31, 1937, by Gordon Williams and Lawrence Crawford, with a supplement including additions and changes through September 30, 1938, by W. S. Eisenlohr, Jr.

867. Hurricane floods of September 1938, by C. G. Paulsen and others.

Division of Power Resources.—The Division of Power Resources collects and compiles information on developed and potential water power of the United States. Information on water-power developments is obtained through the cooperation of the field engineers of the Division of Surface Water and the Federal Power Commission.

During the year a report on the construction of water-power plants in different countries of the world during 1939 was compiled with the cooperation of the Bureau of Foreign and Domestic Commerce of the Department of Commerce for publication in the Encyclopedia Britannica's 1940 Book of the Year. Reports on construction of water-power plants were received from 44 countries in time to be included in the report. Reports continue to come in from other countries, and to date about 70 countries have reported. Owing to present war conditions probably no attempt will be made to obtain reports of power-plant construction in foreign countries in 1940.

A compilation was made of the capacity of water wheels and water-power plants previous to 1921, the date of the Geological Survey's first comprehensive report of the capacity of water wheels in the United States by States. The compilation included reports of capacity of water wheels for 1869, 1879, 1902, 1912, and 1917. The statistics on developed water power for each of those years were based on census reports of manufactures for 1869, 1879, 1889, 1904, 1909, 1914, and 1919, reports of electrical industries for 1902, 1907, 1912, and 1917, and reports of mines and quarries, drainage and irrigation for various years. The figures for total capacity of water wheels by States for selected years from 1869 to 1917, with the records already published beginning with 1921 and continuing to date, will give a complete picture of the water-power development in the United States for the past 70 years and will be a valuable addition to information now available.

CONSERVATION BRANCH

The work of the Conservation Branch involves surveys and investigations for an inventory of the water and mineral resources of the public domain, supervision of private operations for development of power and production of minerals from public and Indian lands and naval petroleum reserves, and supplying information and advice to numerous land-administrative agencies of the Government.

These activities were maintained throughout the year but not on the comprehensive and detailed scale that the work warranted, owing to inadequate funds. The amount of field supervision required, which has become greater each year, again increased materially. On public land alone 235 operating properties were added to the number under supervision. Mineral production during the year from public and Indian lands and naval petroleum reserves under supervision had an estimated value of \$80,000,000, and the revenue accrued therefrom amounted to about \$8,000,000. Compared with this substantial revenue, the cost of supervision is small.

In addition to their regular activities members of the Branch were engaged in conservation work on related Public Works projects.

MINERAL CLASSIFICATION DIVISION

The office activities of the Mineral Classification Division were directed largely to determining the areas subject to inclusion in plans for unit or cooperative development submitted by holders of Government oil and gas prospecting permits and leases; to consideration of permits in such plans subject to leases; to consideration of oil and gas leases to be exchanged for outstanding oil and gas prospecting permits; to action on applications for rights-of-way over public lands for irrigation works, oil and gas pipe lines, highways, and other purposes; to preparation of reports on initial applications for oil and gas leases; to determination of interests in Federal land included in assignments recommended for approval by the Department; and to classifying lands as to their mineral character, including coal, oil, and gas, that are embraced in applications for surface rights under the non-mineral public-land laws.

For mineral classification, information was obtained on the occurrence of coal in New Mexico, Utah, Washington, and Wyoming; of oil and gas in Montana, New Mexico, Oklahoma, South Dakota, and Wyoming; and of phosphate in Idaho, Montana, Utah, and Wyoming. Geologic conditions were examined at 5 dam sites in Oregon and 1 dam site in Washington.

In the work of the Division, 7,118 cases requiring technical consideration were disposed of during the year; 820,782 acres in New Mexico and 251,251 acres in Utah were restored from coal withdrawals; and 128,165 acres in Utah were classified as coal land and 188,349 acres as noncoal land. In addition, a revision of the definitions of the known geologic structure of 12 producing oil and gas fields and the initial definition of 12 new fields were prepared and promulgated.

The aggregate area of the outstanding definitions of the known geologic structure of oil and gas fields on June 30, 1940, amounted to 1,378,526 acres in California, Colorado, Montana, New Mexico, North Dakota, Oklahoma, Utah, and Wyoming.

WATER AND POWER DIVISION

The work of obtaining basic information on the water-power resources and storage possibilities of public lands and of making it available for use in the administration of public-land laws and to Federal and other agencies engaged in planning, constructing, and operating water-power projects was continued in the field but on a decreased scale owing to exhaustion of the funds made available by

the Public Works Administration. River-utilization surveys covering 165 miles of streams and tributaries and detailed surveys at 11 dam sites were made. Surveys of mineral leaseholds embracing an area of 4 square miles were completed. Preparation of reports on geologic conditions at dam sites examined in the field during the preceding year and an experimental geophysical examination of one potash leasehold were continued.

Office activities included action resulting in the addition of 18,598 acres to outstanding water-power reserves in 12 public-land States and the elimination of 23,685 acres from such reserves in 5 States, with a net decrease in the total reserved area in 22 States and Alaska to 6,685,489 acres. The addition of 2,524 acres to reservoir-site reserves made a total of 137,172 acres withdrawn. Field supervision, in conjunction with the Water Resources Branch, of power projects for the Federal Power Commission involved supervision of construction and operation on 160 projects, continuation of studies of cost accounting on 9 of these projects, and investigations and reports on 3 of the projects. Field supervision of power projects holding permits and grants from the Department of the Interior involved 216 projects.

MINING AND OIL- AND GAS-LEASING DIVISIONS

The work of the Mining and Oil- and Gas-leasing Divisions consists of inspectional and regulatory supervision of mineral prospecting and development on public and Indian lands and naval petroleum reserves.

The Mining Division is charged with supervision of all operations for the discovery and development on public land of deposits of coal, potassium, sodium, phosphate, and oil shale; in New Mexico and Louisiana of sulfur; on certain land grants of gold, silver, and mercury; and on restricted, allotted, and tribal Indian lands of all minerals except oil and gas. This supervisory and regulatory work during the fiscal year was accomplished through six field offices at Denver, Colo., Billings, Mont., Carlsbad, N. Mex., McAlester and Miami, Okla., and Salt Lake City, Utah, and through a cooperative agreement approved May 4, 1935, with the Department of Mines, Territory of Alaska.

The work of the Oil- and Gas-leasing Division includes inspectional and regulatory supervision of all operations for the discovery, development, and production of petroleum and natural gas on public land of the United States, on naval petroleum reserves, and on all Indian land subject to departmental jurisdiction, both tribal and allotted, except the Osage Reservation, Okla. The work was accomplished during the year through 16 field offices and suboffices at Los Angeles and Taft, Calif., Roswell and Farmington, N. Mex., Tulsa, Oklahoma City, Ardmore, Holdenville, and Drumright, Okla., Den-

ver, Colo., Casper, Midwest, and Thermopolis, Wyo., Billings and Great Falls, Mont., and Salt Lake City, Utah.

Public land.—The number of public-land properties under supervision of the Mining Division at the end of the year was 684, an increase of 1 since June 30, 1939. Coal properties in 14 States and Alaska decreased 8, to 567; potash properties in 2 States decreased 7, to 21; sodium properties in 7 States increased 32, to 78; phosphate properties in 3 States were again 7; sulfur properties in 1 State decreased 16, to 11. The decrease in coal properties resulted indirectly from the Secretary's instructions of January 24, 1934, and that in potash properties from the Secretary's Order No. 914 of April 5, 1935. The Secretary's Order No. 1294 of July 2, 1938, restricted further issuance of phosphate leases and permits. In prospecting for the above-named minerals 21 boreholes were drilled during the year.

Accidents to employees working in mines under departmental lease are generally fewer than in competitive mines not on Government land, and of the 70 awards to coal and potash mines made by the Joseph A. Holmes Safety Association for the calendar year 1939, 8 were made to departmental lessees. The use of safety appliances and safety clothing is increasing generally throughout mines on Government land.

The number of public-land properties under supervision of the Oil and Gas-leasing Division decreased about 24 percent, to a total of 6,504, involving 8,055,845 acres in 20 States and Alaska. Drilling activity on public land during the fiscal year included the commencement of 468 new wells and the completion of 472 wells, of which 361 were rated as productive of oil and gas and 111 as barren. The total number of public-land wells under supervision on June 30, 1940, was 9,338, including 4,779 capable of oil or gas production. Production of petroleum from public land in the fiscal year 1940 was about 5 percent more than in the preceding year; production of gas decreased about 9 percent; and production of natural gasoline increased about 7 percent.

The Division continued to assist in the preparation of unit or cooperative plans of operation and development and in reviewing and revising the engineering and royalty features of such plans after their submission. At the end of the year a total of 1,680 plans of unit or cooperative development for oil or gas pools, fields, or areas involving public land had been filed with the Geological Survey, of which 120 had been given final approval by the Secretary of the Interior, 1,554 had been rejected, withdrawn, or suspended, and 6 were pending final action. During the year 15 unit agreements were filed, 36 acted upon, and 9 approved by the Secretary of the Interior.

Indian land.—The number of Indian-land properties under supervision of the Mining Division during the year was 241 in 12 States. These properties involved 42 lead and zinc leaseholds in the Quapaw Reservation, Okla., with aggregate royalty accruals of \$610,359.77, an increase of 16 percent over that of the preceding year; 51 coal leaseholds on segregated Choctaw and Chickasaw land and restricted allotted land in Oklahoma, with an aggregate production that increased from 268,503.78 tons in 1939 to 355,350.56 tons in 1940, and revenue accruals from royalties, bonuses, and sale of coal lands amounting to \$46,332.60; 1 leased purchased tract, 1 unleased purchased tract, and 1 asphalt lease on segregated land in Oklahoma and 138 properties in 11 Western States, of which 14 were agency coal mines, 24 coal leases, 49 individual Indian coal mines, and 51 metalliferous leases and nonmetalliferous leases other than coal leases.

Oil and gas supervision involved 4,519 leaseholds, 4,332 wells, and aggregate bonus, royalty, and rental accruals estimated at \$2,000,000 for Indian beneficiaries in 8 States and 33 different tribes. The cooperative duties involved royalty accounting; appraisals of bonuses, royalty offers, and pollution damages; assistance to lessees of Indian land on operating problems; and assistance to agency officials and tribal councils on technical phases of leasehold development and administration.

Naval Petroleum Reserves.—On behalf of the Navy Department supervision was continued during the year over operations for the production of oil and gas within Naval Petroleum Reserves Nos. 1 and 2, in California, and for the conservation of shut-in production within Naval Petroleum Reserve No. 3, in Wyoming. Production from 286 wells on the reserves aggregated 3,832,002 barrels of petroleum, 2,295,023,000 cubic feet of natural gas, and 10,118,638 gallons of natural gasoline and had an aggregate royalty value of \$938,499.86.

PUBLIC WORKS PROJECTS

Under the supervision of the personnel of the Conservation Branch, expenditures aggregating \$14,352.72 were made during the year from Public Works funds allotted for field investigations and conservation work. On 10 projects \$9,303.92 was expended for river-utilization surveys of power and storage resources of important streams in 10 States. On 3 projects, \$5,048.80 was expended in 3 States to plug and abandon or condition for use as a source of water numerous wells that had been drilled for oil and gas on public land and improperly abandoned or merely deserted, and to fill, bulkhead, or otherwise safeguard abandoned mines or openings on Indian land.

SUMMARY OF FIELD ACTIVITIES, BY STATES

Alabama.—Supervised one lease and one prospecting permit for coal and one lease for oil and gas on public land.

Alaska.—Supervised 1 power project, 2 leases, 7 prospecting permits, and 3 licenses for coal, and 13 leases and 101 prospecting permits for oil and gas on public land.

Arizona.—Investigated 1 water-power site. Supervised 19 power projects, 1 prospecting permit for coal and 2 for sodium, and 8 prospecting permits for oil and gas on public land, and 6 agency coal mines, 6 asbestos leases, 1 gold lease, and 1 guano lease on Indian land.

Arkansas.—Examined one tract in Pike County for mineral classification. Supervised one power project.

California.—Supervised 109 power projects, 2 prospecting permits for coal and 33 for sodium, 1 sodium lease, 6 potash leases, and 690 leases and 227 prospecting permits for oil and gas on public land, 1 coal lease and 3 gold leases on Indian land, and 22 oil and gas leases on naval petroleum reserves.

Colorado.—Supervised 12 power projects, 87 leases, 19 prospecting permits, and 8 licenses for coal, 1 sodium lease, and 201 leases and 268 prospecting permits for oil and gas on public land and 2 coal leases on Indian land. Surveyed 12 linear miles of river basin.

Idaho.—Supervised 45 power projects, 2 leases and 6 prospecting permits for coal, 1 phosphate lease, and 17 leases and 22 prospecting permits for oil and gas on public land and 1 limestone lease on Indian land. Examined 5 dam sites for geologic conditions. Surveyed 12 linear miles of river basin and 4 dam sites.

Kansas.—Supervised 32 leases and 2 prospecting permits for oil and gas on public land and 5 leases for oil and gas on Indian land.

Louisiana.—Supervised 63 leases for oil and gas on public land.

Michigan.—Supervised one lease for oil and gas on public land and seven leases for oil and gas on Indian land. Investigated one water-power site.

Mississippi.—Supervised one power project.

Montana.—Investigated an occurrence of phosphate near Monida, Beaverhead County. Supervised 60 power projects, 88 leases, 11 prospecting permits, and 41 licenses for coal, 5 phosphate leases, and 427 leases and 241 prospecting permits for oil and gas on public land and 3 agency coal mines, 7 coal leases, 9 coal permits, 4 silver-lead-gold leases, 1 bentonite lease, and 45 leases for oil and gas on Indian land. Examined 2 applications for complex-metal leases and 1 group of complex-metal mining claims on Indian land. Surveyed 23 linear miles of river basin and 2 dam sites.

Nebraska.—Supervised one lease for oil and gas on public land.

Nevada.—Supervised 30 power projects, 5 coal-prospecting permits, 8 sodium permits, and 13 leases and 33 prospecting permits for oil and gas on public land and 11 marl leases on Indian land. Surveyed 42 linear miles of river basin and 2 dam sites.

New Mexico.—Continued an areal, stratigraphic, and subsurface structural investigation in Lea and Eddy Counties for mineral classification. Supervised 11 power projects, 21 leases and 20 prospecting permits for coal, 48 permits for sodium, 15 potash leases, 19 sulfur permits, and 1,320 leases and 336 prospecting permits for oil and gas on public land and 6 agency coal mines, 2 coal leases, 49 individual Indian coal mines, and 9 leases for oil and gas on Indian land.

Examined 1 potash leasehold by geophysical methods. Surveyed 31 linear miles of river basin.

New York.—Supervised two leases for oil and gas on Indian land.

North Dakota.—Supervised 51 leases, 1 prospecting permit, and 20 licenses for coal, 4 prospecting permits for sodium, and 8 leases and 18 prospecting permits for oil and gas on public land and 1 coal permit on Indian land.

Oklahoma.—Completed an investigation of subsurface structural conditions in southern Seminole and northern Pontotoc Counties. Supervised 71 leases and 7 prospecting permits for oil and gas on public land, 14 leases and 22 mining permit leases for coal, 1 leased purchased tract and 1 unleased purchased tract for coal, 1 asphalt lease, and 1 right-of-way lease on segregated tribal and restricted allotted Indian lands, 42 zinc-lead leases on Quapaw Indian land, and 4,375 leases for oil and gas on Indian land.

Oregon.—Examined 5 dam sites for geologic conditions. Supervised 37 power projects, 2 coal-prospecting permits, and 11 leases and 11 prospecting permits for oil and gas on public land. Investigated 3 water-power sites.

South Dakota.—Supervised 4 leases, 2 prospecting permits, and 2 licenses for coal, and 32 leases and 6 prospecting permits for oil and gas on public land.

Utah.—Investigated areal geologic conditions as to coal possibilities in the Horse Canyon district, Carbon and Emery Counties. Supervised 14 power projects, 62 leases, 30 prospecting permits, and 1 license for coal, 1 sodium permit, 1 phosphate lease, and 135 leases and 364 prospecting permits for oil and gas on public land, and 6 gilsonite leases on Indian land.

Washington.—Examined 1 dam site for geologic conditions. Supervised 23 power projects, 1 lease and 6 prospecting permits for coal, and 1 lease and 1 prospecting permit for oil and gas on public land, and 5 silver-lead-gold leases, 6 tungsten leases, and 33 leases for oil and gas on Indian land. Surveyed 3 dam sites and 42 linear miles of river basin.

Wisconsin.—Supervised two power projects.

Wyoming.—Continued an areal, structural, and stratigraphic investigation in the eastern parts of Niobrara and Weston Counties; completed a structural and stratigraphic investigation in the North Baxter Basin gas area, Sweetwater County; investigated coal and phosphate resources of an area near Munger, Teton County, and the coal possibilities in the Laramie Basin area, Albany County; completed geologic structural investigations of the Red Springs anticline and Hamilton Dome areas, Hot Springs County; continued geologic investigations for mineral classification purposes of the Osage oil field area, Weston County, and of the Garland oil and gas field area, Big Horn County; and completed a geologic structural investigation of the East Lance Creek oil and gas field area for mineral-classification purposes. Supervised 11 power projects, 64 leases, 38 prospecting permits, and 23 licenses for coal, 1 sodium lease, and 1,261 leases and 516 prospecting permits for oil and gas on public land, and 2 coal leases and 43 leases for oil and gas on Indian land. Tested shut-in pressures on Naval Petroleum Reserve No. 3 for the purpose of conserving shut-in production. Performed technical supervision at Emergency Conservation Camp 858, established for conserving coal deposits. Surveyed 3 linear miles of river basin.

WORK ON PUBLICATIONS

Texts.—The book publications of the year numbered 49 in the regular series and 21 pamphlets and circulars for administrative use. The total number of pages was 9,658. Besides these printed

publications 40 brief papers were issued in mimeographed form as memoranda for the press or as informative circulars. Indexes were prepared for 16 publications, covering 2,223 pages.

Illustrations.—The illustrations prepared consisted of 771 drawings and photographs. Five hundred and ninety-two illustrations to accompany 59 reports were transmitted to the printer, and 444 proofs and 25 edition prints were examined.

Geologic map editing and drafting.—The geologic map of the Front Range, Colo., was printed. Progress was made on the Montevallo-Columbiana, Ala., folio. Geologic maps, sections, and illustrations for 17 reports were examined and edited; proofs of 15 geologic maps and sections were read; and 139 geologic maps, sections, and illustrations for 37 reports were edited, drawn, and prepared for engraving. The printing of some of these maps for State geological surveys was supervised, and proofs were read. Thirty-six photographs were lettered and retouched to show the geologic structure, and 45 lantern slides were hand-colored. Geologic maps and illustrations for 5 reports were in progress at the end of the year.

Distribution.—A total of 667 publications, comprising 49 new books and pamphlets, 102 new or revised topographic and other maps, 41 Tennessee Valley Authority maps with contours, 322 reprinted topographic and other maps, 84 new advance sheets, and 69 reprinted advance sheets were received during the year. A number of special pamphlets and forms for administrative use were also received and distributed. The total units of all publications received numbered 102,906 books and pamphlets and 1,233,131 topographic and other maps, a grand total of 1,336,037. The division distributed 67,735 books and pamphlets, 1,835 geologic folios, and 808,764 maps, a grand total of 878,334, of which 1,695 folios and 704,345 maps were sold.

The net proceeds (gross collections less copying fees and amounts refunded) from the sales of publications were \$38,653.47, which included \$38,055.67 for topographic and geologic maps and \$597.80 for geologic folios. In addition to this amount, \$12,849.03 was repaid to the Survey by other establishments of the Federal Government at whose request maps or folios were furnished. The total net receipts, therefore, were \$51,502.50.

Engraving and printing.—During the year 68 newly engraved topographic maps, including 8 revised maps, were printed, and also 34 special maps. Corrections were engraved on the plates of 242 maps. Reprint editions of 300 engraved topographic maps and 22 photolithographed State and other maps were printed and delivered. In

addition, 49 new topographic maps had been engraved and were in press June 30. Of new and reprinted maps, 424 different editions, amounting to 1,109,301 copies, were delivered.

A large amount of work was done for 67 other units of the Federal Government and State governments.

Of topographic maps and contract and miscellaneous work of all kinds, a grand total of 2,087,585 copies was printed and delivered.

The photographic laboratory made 8,792 negatives (including 3,285 wet plates for photolithographs, 901 wet plates for photographic prints, 35 paper negatives, 98 dry plates and films, 554 lantern slides, 169 diapositives, 89 halftone negatives, and 3,661 field negatives), 28,188 prints (including 1,461 blue contact prints, 1,345 blue line on metal-mounted drawing paper and other types of prints, 14,354 maps and diagrams, 10,608 glossy prints, 379 bromide enlargements, and 41 celluloid positives), 2,426 photolithographic press plates, 115 intaglio etchings, and 9 celluloid transfer prints, and mounted 2,300 prints.

LIBRARY

The total number of books and separate items circulated by the library amounted to more than 40,000. Almost 19,000 new books, periodicals, maps, and other items were received, and nearly 10,000 new cards were filed in the catalog.

The compilation of the consolidated volume of the bibliography of North American geology for 1929-39 is well under way.

APPROPRIATIONS AND EXPENDITURES

The appropriation made directly for the work of the Geological Survey for the fiscal year 1940 included 11 items, amounting to \$3,468,000, of which \$81,417.18 remained unobligated on June 30, 1940. In addition, \$10,100 was allotted from the appropriation for contingent expenses of the Department of the Interior for miscellaneous supplies.

Financial Statement of the Geological Survey for the Fiscal Year 1940

	Funds available			Obligations		
	Amounts appropriated or transferred	Repayments and adjustments		Disbursements	Outstanding liabilities	Total
		Made	To be made			
Salaries.....	\$150,000.00	\$115.80	\$37,635.31	\$150,093.84	\$74,638.64	\$150,093.84
Topographic surveys.....	725,000.00	476,087.06	10,678.91	1,140,879.34	21,515,517.98	23,204.39
Geologic surveys.....	500,000.00	31,534.25	1,201.77	513,957.30	535,483.07	6,730.09
Strategic and critical minerals.....	150,000.00	1,201.77	1,671.07	124,756.55	17,039.63	9,527.25
Alaskan mineral resources.....	60,000.00	3,840.30	1,671.07	51,515.23	65,508.06	3.31
Gaging streams.....	1,143,000.00	752,304.76	185,616.62	2,032,952.88	23,250.14	24,718.36
Classification of lands.....	105,000.00	1,383.14	81.57	104,642.91	1,426.90	394.90
Printing and binding.....	125,000.00	2.85	---	125,002.85	96,169.97	13,732.98
Preparation of illustrations.....	25,000.00	119.28	---	15,099.90	111,269.87	90.08
Geologic and topographic maps.....	170,000.00	119,609.91	34,095.52	296,683.14	321,782.75	1,922.68
Mineral leasing.....	315,000.00	12,063.25	91.95	318,934.34	7,149.68	1,071.18
Total.....	13,468,000.00	1,398,262.37	269,962.61	4,774,431.76	280,376.04	5,054,807.80
Barracks and quarters, Army (transfer to Interior, Geological Survey), 1940.....	8,400.00	---	---	5,686.45	383.04	6,069.49
Federal Power Commission (transfer to Interior, Geological Survey), 1940.....	350.00	---	---	350.00	---	350.00
Flood control, general (transfer from Agriculture to Interior, Geological Survey).....	295,343.32	361.33	1,366.66	66,008.99	92.68	66,101.67
Flood control, general (transfer to Interior, Geological Survey).....	358,221.50	---	---	396,354.77	495.77	396,850.54
Flood control, Mississippi River and tributaries (transfer to Interior, Geological Survey).....	4,000.00	26,000.57	---	29,960.47	---	29,960.47
Improvement and maintenance, irrigation systems, Crow Reservation, Mont. (receipt limitation) (transfer to Geological Survey), 1940.....	1,300.00	---	---	1,300.00	---	1,291.20
Irrigation, Indian reservations (reimbursable) (transfer to Geological Survey), 1940.....	18,250.00	---	---	18,250.00	---	18,225.81
Maintenance and improvement of existing river and harbor works (transfer to Interior, Geological Survey).....	431,045.88	1,315.58	312.79	252,157.75	592.20	252,749.95
Maintenance, Wapato irrigation and drainage system, etc., Yakima Reservation, Wash. (receipt limitation) (transfer to Geological Survey), 1940.....	500.00	---	---	500.00	---	500.00

¹ In addition to these appropriations there was an allotment of \$10,100.00 for miscellaneous supplies from the appropriation for contingent expenses of the Interior Department.

² Includes \$20,343.32 unobligated on June 30, 1939, and continued available for expenditure during the fiscal year 1940.

³ Includes \$12,059.25 unobligated on June 30, 1939, and continued available for expenditure during the fiscal year 1940.

⁴ Includes \$59,727.88 unobligated on June 30, 1939, and continued available for expenditure during the fiscal year 1940.

Financial Statement of the Geological Survey for the Fiscal Year 1940—Continued

	Funds available			Obligations			Balance
	Amounts appropriated or transferred	Repayments and adjustments		Total	Disbursements	Outstanding liabilities	
		Made	To be made				
Operation and conservation of naval petroleum reserves (transfer to Interior, Geological Survey), 1940.....	40,000.00			40,000.00	39,930.85	39,930.85	69.15
Public Works Administration, act of 1938 (allotment to Interior, Geological Survey), 1938-41.....	\$ 698,954.82	1,959.67		700,914.49	667,300.71	1,231.05	32,382.73
Public Works Administration, (allotment to Interior, Geological Survey), 1935-41.....	\$ 58,688.83	273.63		58,963.46	33,358.10	839.96	24,198.06
Reclamation fund, special fund (transfer to Geological Survey).....	20,000.00	8.33		20,008.33	18,391.64	.30	1,616.39
Special and technical investigations, International Joint Commission, United States and Great Britain (transfer to Interior), 1940.....	45,500.00	20.29		45,520.29	44,526.96	506.31	487.02
Supervising mining operations on leased Indian lands (reimbursable) (transfer to Geological Survey), 1940.....	100,000.00	6.80	78.33	100,085.13	99,214.88	158.67	711.58
Tennessee Valley Authority fund (transfer to Interior, Geological Survey), 1940.....	102,000.00	10,021.97	2,536.02	114,557.99	109,486.27	4,382.91	688.81
Working fund, Interior, Geological Survey (Agriculture, highway fund, act of June 16, 1933, National Industrial Recovery).....	20,000.00	2,114.96	254.16	22,369.12	21,834.43	534.69	
Working fund, Interior, Geological Survey (cooperative construction of rural post roads).....	\$ 13,820.80	906.65	1,011.34	15,738.79	6,576.80		9,161.99
Working fund, Department of the Interior (transfer from Army engineers to Geological Survey for topographic mapping).....	\$ 1,059.67			1,059.67	1,059.67		
Transfer total.....	\$ 4,278.90			4,278.90	2,379.06	1,657.12	242.72
Grand total.....	2,061,714.72	42,989.78	5,559.30	2,110,263.80	1,814,550.35	10,919.16	284,794.29
	5,529,714.72	1,441,252.15	275,521.91	7,246,488.78	6,588,982.11	291,295.20	366,211.47

^a Balance unobligated on June 30, 1939, and continued available for expenditure during the fiscal year 1940.

^b Includes \$23,689.83 unobligated on June 30, 1939, and continued available for expenditure during the fiscal year 1940.

Classification of Obligations Incurred by U. S. Geological Survey During the Fiscal Year
Ending June 30, 1940

	Salaries	Topographic surveys	Geologic surveys	Strategic and critical minerals	Alaskan mineral resources	Gaging streams
Salaries of permanent employees.....	\$150,093.84	\$861,965.91	\$420,484.03	\$59,746.96	\$36,459.04	\$1,292,547.88
Wages of temporary employees.....		449,401.67	25,572.53	15,820.48	11,467.98	387,781.68
Supplies and materials.....		11,944.89	7,703.66	4,283.45	3,297.92	42,025.75
Other storage and pasturage of animals.....		382.75	62.75	132.03		940.00
Communication services.....		1,150.90	302.91	150.41	30.99	8,085.46
Travel expenses.....		157,393.31	31,930.49	19,016.08	9,887.62	176,177.44
Transportation of things.....		4,237.60	2,232.76	3,166.27	1,155.49	17,248.99
Hire, maintenance, repair, and operation of freight-carrying vehicles.....		61,343.27	5,661.44	2,905.91	4.88	73,089.56
Printing and binding.....		70,708.10	11,254.32	3,654.56	5,892.68	5,892.45
Furnishing of heat, light, power, water, and electricity.....		2.10	8.75			887.54
Rents.....		18.20				4,773.14
Repairs and alterations.....		11,983.12	5,658.22	144.47	269.58	57,412.78
Special and miscellaneous current expenses.....		30.00	60.40	7.34	52.67	83.64
Purchase of passenger-carrying vehicles.....		1,776.81	1,619.79	4,868.59		26,324.33
Purchase of freight-carrying vehicles.....		3,506.11	5,538.45	3,082.53		35,548.10
Purchase of scientific instruments and parts.....		11,120.08	8,733.78	7,987.23	897.72	135,777.05
Other equipment.....		18,444.69	10,520.11	5,388.87	1,419.98	40,692.63
Structures and parts.....						153,192.67
Miscellaneous refunds, adjustments, and transfers.....		297,943.43	5,782.88	11,411.00	741.00	507,309.18
Total.....	150,093.84	1,963,352.94	543,127.27	141,766.18	71,577.55	2,966,790.27

	Classification of lands	Printing and binding	Preparation of illustrations	Geologic and topographic maps	Mineral leasing	Total
Salaries of permanent employees.....	\$93,475.43		\$24,554.70	\$248,411.52	\$401,620.78	\$3,589,360.09
Wages of temporary employees.....	1,340.06				9,598.79	900,983.19
Supplies and materials.....	561.57		237.64	26,758.14	4,807.22	101,620.24
Other storage and pasturage of animals.....						1,517.53
Communication services.....	233.59			1.10	3,154.20	13,109.56
Travel expenses.....	6,140.52		3.90	255.57	31,437.06	432,241.99
Transportation of things.....	114.42			370.50	1,350.01	29,876.04
Hire, maintenance, repair, and operation of freight-carrying vehicles.....	492.08				959.92	144,457.06
Printing and binding.....	1,042.50	\$111,269.87	205.61	11,359.74	428.52	222,708.35
Furnishing of heat, light, power, water, and electricity.....					2,940.40	3,838.79
Rents.....					720.00	5,511.34
Repairs and alterations.....	134.93		27.35	11,376.59	2,597.91	89,604.95
Special and miscellaneous current expenses.....					97.98	332.03
Purchase of passenger-carrying vehicles.....	2,183.26				7,022.76	43,795.54
Purchase of freight-carrying vehicles.....						47,675.19
Purchase of scientific instruments and parts.....	2.00			1,993.60	34.59	166,546.05
Other equipment.....	201.44			21,192.66	6,618.44	104,478.82
Structures and parts.....						153,192.67
Miscellaneous refunds, adjustments, and transfers.....	148.01			63.33	6,029.05	829,427.88
Total.....	106,069.81	111,269.87	25,029.20	321,782.75	479,417.63	6,880,277.31

In addition to the above amounts, there was expended directly by cooperating agencies \$52,296.90 for topographic surveys, \$663.00 for geologic surveys, and \$540,791.65 for stream gaging.

APPENDIX

Summary of Outstanding Mineral Withdrawals and Classifications

[June 30, 1940, in acres]

State	Coal		Oil		Oil shale		Phosphate		Potash
	With- drawn	Classified as coal land	With- drawn	Classi- fied as oil land	With- drawn	Classi- fied as oil-shale land	With- drawn	Classi- fied as phos- phate land	With- drawn
Alaska.....		56,993							
Arizona.....	139,415								
Arkansas.....		61,160							
California.....	17,603	8,720	1,178,392						90,324
Colorado.....	4,142,233	3,082,272	215,370		1,172,778	952,239			
Florida.....							66,796	120	
Idaho.....	11,520	4,603					276,239	270,036	
Louisiana.....			466,990	4,233					
Montana.....	6,044,408	19,373,884	1,336,697	67,651			280,069	3,833	
Nevada.....	83,673								39,422
New Mexico.....	3,298,834	1,074,723							9,282,160
North Dakota.....	5,954,364	11,178,286	84,894						
Oregon.....	4,361	18,887							
South Dakota.....		250,093							
Utah.....	3,152,792	1,395,862	1,035,034		2,737,274	2,703,755	277,344	2,937	
Washington.....	691,801	141,444							
Wyoming.....	2,143,991	26,847,235	541,777		2,079,897	425,214	989,133	25,293	
Total.....	25,684,995	33,494,162	4,859,154	71,884	5,989,949	4,081,208	1,889,601	302,219	9,411,906

¹ Includes 3,151 acres of coal land reserved for use of the United States (coal reserve No. 1).² Includes 2,078 acres of coal land reserved for use of the United States (coal reserve No. 2).³ Includes 13,578 acres withdrawn as helium reserve.

Definitions of Known Geologic Structure, Fiscal Year 1940

State	Field	Date promul- gated	Field area (acres)
California.....	Agey.....	Dec. 4, 1939	120
Do.....	Coalinga-Guajarral Hills.....	do.....	4,244
Do.....	Coalinga West Side ¹	do.....	16,162
Do.....	Eastmont.....	July 19, 1939	760
Do.....	Keating.....	Dec. 4, 1939	160
Do.....	Kern Front ¹	do.....	5,760
Do.....	Kern River ¹	do.....	10,612
Do.....	Lost Hills ¹	do.....	4,766
Do.....	McKittrick Front ¹	Feb. 15, 1940	6,298
Do.....	McVan.....	Dec. 4, 1939	440
Do.....	Mount Poso ¹	do.....	3,080
Do.....	Northeast Coalinga.....	Dec. 15, 1939	2,614
Do.....	North Mount Poso.....	Dec. 4, 1939	1,441
Do.....	Ring.....	do.....	480
Do.....	Round Mountain ¹	July 19, 1939	4,311
Do.....	Tembler.....	Feb. 15, 1940	590
Do.....	West Kern Front ¹	Dec. 4, 1939	1,920
Colorado.....	Bell Rock.....	May 18, 1940	2,463
Do.....	Piceance Creek ¹	Oct. 5, 1939	14,470
Do.....	South McCallum.....	July 14, 1939	4,524
New Mexico.....	Bloomfield ¹	Apr. 13, 1940	1,760
Do.....	Hospah.....	Jan. 5, 1940	719
Utah.....	Clay Basin ¹	Apr. 11, 1940	6,688
Wyoming.....	East Lance Creek ¹	Jan. 3, 1940	3,120

¹ Revised.

Mineral Production From Public Land and Revenues Therefrom, Fiscal Year 1940

State	Petro- leum (barrels)	Natural gas (M cubic feet)	Gasoline (gallons)	Coal (short tons)	Potas- sium salts (short tons)	Sodium salts (short tons)	Phos- phate rock (long tons)	Accrued revenues
Alabama.....				55,829				\$5,582.90
Alaska.....				149,476				7,456.15
Arizona.....				270				2,622.87
California.....	14,680,189	32,569,574	2,803,229			96,200		2,574,691.51
Colorado.....	944,352	1,391,425	49,493	515,541		304		124,287.06
Idaho.....				1,646				573.45
Louisiana.....	298,693	1,379,274	507,515					84,148.89
Michigan.....								17.50
Montana.....	458,811	2,665,270	11,150	303,746			9,425	99,058.92
Nebraska.....								30.00
Nevada.....				9				327.99
New Mexico.....	9,382,138	23,231,181	9,804,034	71,306	663,855	10,334		1,029,258.89
North Dakota.....		35,707		658,742				38,991.10
Oklahoma.....	117,163		133,134					11,371.96
Oregon.....								200.50
South Dakota.....				1,613				750.79
Utah.....	7,468	3,191,394	217,504	1,078,535				156,281.77
Washington.....				27,040				2,704.01
Wyoming.....	13,954,927	12,916,346	25,948,871	1,079,815				1,938,373.87
Total.....	39,843,241	77,380,171	39,474,930	3,943,568	663,855	106,838	9,425	6,076,730.13
Total, 1939.....	37,911,269	84,995,861	37,228,062	4,104,326	477,920	77,653	26,017	5,968,571.72

General Summary of Cases Involving Land Classification

Class of cases	Record for fiscal year 1939-40						Record since receipt of first case	
	Pending prior to July 1, 1939	Received during fiscal year	Total	Acted on during fiscal year	Pending June 30, 1940	Gain or loss during fiscal year	Received	Acted on
Mineral leasing laws:								
Permit applications.....	21	320	341	323	18	+3	63,020	63,002
Lease applications.....	27	2,230	2,257	1,866	391	-364	12,776	12,385
Committee cases.....							13,322	13,322
Concurrence.....	52	2,866	2,918	2,799	119	-67		
Interference (surface rights).....	5	173	178	173	5			
Unit operation plans.....	27	15	42	36	6	+21	1,680	1,674
Cases involved in unit plans.....	132	231	363	338	25	+107	5,872	5,847
Development (drilling operations, etc.).....	5	84	89	86	3	+2	17,764	17,761
Miscellaneous.....							7,952	7,952
Mineral classification:								
Oil and gas (including "349").....	37	1,399	1,436	1,312	124	-87	33,554	33,430
Miscellaneous.....								
Water and power:								
Federal Power Commission:								
Preliminary permits.....	2	87	89	81	8	-6	657	649
Licenses.....							28	28
Determinations under sec. 24.....	15	39	54	47	7	+8	791	784
Classification.....	3	4	7	7		+3	569	569
Rights-of-way.....	12	117	129	103	26	-14	7,652	7,626
Irrigation project reports.....	1	4	5	1	4	-3	949	945
Miscellaneous.....								
General information:								
General Land Office (co-ops., etc.).....	7	614	621	542	79	-72		
Indian Office.....							9,549	9,549
Miscellaneous.....								
Total.....	346	8,183	8,529	7,714	815	-469		

Topographic Mapping by the Geological Survey in the United States, Puerto Rico, and Hawaii, to June 30, 1940

State	Total area mapped during fiscal year 1940 (square miles)								Types of standard surveys with contours, fiscal year 1940 (square miles)	Total area mapped to June 30, 1940 (square miles)	Percentage of total area of State mapped to June 30, 1940	Control, fiscal year 1940					
	For publication on standard scales, with contour intervals from 5 to 100 feet, mapped on field scale of 1 to—											New survey	Resurvey	Revision	Spirit levels (miles)	Transit traverse (miles)	Triangulation stations established
Planimetric on scale of 1 to 1—	48,000	24,000	10,000	12,000	15,840	20,000	24,000	48,000	96,000								
Alabama.....							342			329	13	22,649	43.6	69	131		
Arizona.....								834		834		30,970	27.2	134			
Arkansas.....							176	305		62	419	24,283	45.5		66	6	
California.....							59	493		50	502	129,193	81.6	272		17	
Colorado.....				15			313	287		138	477	57,662	55.5	206		60	
Connecticut.....							54				54	4,965	100.0				
Delaware.....								6			6	2,370	100.0				
District of Columbia.....												70	100.0				
Florida.....							340			340		6,935	11.8	101			
Georgia.....							19	237			370	25,202	42.5	20	54		
Idaho.....					2 114		39	128		81	72	37,208	44.4	80			
Illinois.....							799			633	149	42,151	74.4	618	204		
Indiana.....							489			489		5,876	16.2	503	416		
Iowa.....							275			275		14,135	25.2				
Kansas.....							524			530	246	65,442	79.7	2,383	462		
Kentucky.....							113			113		27,559	67.9	97			
Louisiana.....			1, 224					518		238	260	11,988	23.9				
Maine.....								493		493		22,468	68.0	96		13	
Maryland.....								210			210	12,327	100.0	131	55		
Massachusetts.....							469			305	228	8,266	100.0	50			
Michigan.....			360				302			386		15,699	27.1				
Minnesota.....								386		386		9,542	11.3				
Mississippi.....								1, 239		239		7,820	16.7				
Missouri.....				3			415	752		1, 548	622	56,373	81.2	317			
Montana.....							518	518		518		37,824	25.7	188		19	
Nebraska.....							174	197		174	197	28,225	36.4	53	33		
Nevada.....							352			96	256	43,536	39.3	235		15	
New Hampshire.....												9,302	100.0				
New Jersey.....							92				92	8,224	100.0	44			
New Mexico.....								671		505	166	33,636	27.4	115		24	
New York.....							96	297		393		49,204	100.0	230	120		
North Carolina.....					2 1,053		27	343		307	1,116	19,529	37.3				
North Dakota.....								468		468		13,871	22.4	58	239		
Ohio.....												41,040	100.0				
Oklahoma.....							48	402		157	293	41,342	59.0	201	240	30	
Oregon.....							496			496		34,132	35.3	174			
Pennsylvania.....							58	1, 026		392	104	41,276	91.5	48	6		
Rhode Island.....							120				120	1,248	100.0				

South Carolina.....	272	406	7	272	406	7	272	406	7	15,772	50.9	160	90	---
South Dakota.....	---	---	---	---	---	---	---	---	---	20,637	26.6	---	---	---
Tennessee.....	---	---	---	---	---	---	---	---	---	23,679	56.3	---	---	---
Texas.....	---	---	---	---	---	---	---	---	---	91,186	34.3	121	99	---
Utah.....	---	---	---	---	---	---	---	---	---	19,886	23.4	31	---	15
Vermont.....	---	---	---	---	---	---	---	---	---	9,099	95.1	21	---	---
Virginia.....	---	---	---	---	---	---	---	---	---	38,030	89.2	121	1,390	---
Washington.....	---	---	---	---	---	---	---	---	---	42,849	62.0	267	70	46
West Virginia.....	---	---	---	---	---	---	---	---	---	24,170	100.0	---	---	---
Wisconsin.....	---	---	---	---	---	---	---	---	---	20,273	36.2	---	---	---
Wyoming.....	---	---	---	---	---	---	---	---	---	35,290	36.0	226	796	---
Total.....	2,011	1,534	21	16,052	122	122	12,564	10,563	619	1,386,032	45.8	7,370	4,471	24
Hawaii.....	---	---	---	---	---	---	---	---	---	6,435	100.0	---	---	---
Puerto Rico.....	---	---	---	---	---	---	---	---	---	1,009	29.4	207	---	32

¹ Compiled from aerial photographs with field examination. Show culture, drainage, and woodland, but no contours.

² Mapped from aerial photographs by stereophotogrammetric methods.

³ Includes 60 square miles mapped on scale of 1:5,000.

⁴ Contour interval 5 meters.

BUREAU OF RECLAMATION

John C. Page, *Commissioner*

ESSENTIAL to a long-time National Defense program is the conservation and utilization of land and water resources in the western one-third of the United States. Through the work of the Bureau of Reclamation, water is being made available for the irrigation of new lands to provide homes for destitute migrants and to insure adequate food supplies for the growing population of the West. Supplemental water is being provided for established agricultural and urban areas threatened with desolation. Low-cost power is being produced for both coastal and inland industrial development and for the recovery of strategic minerals. The growing market in the West for American manufactured goods and agricultural products of other areas is of increasing importance in view of the possible loss of foreign trade. Natural resources must be developed, industries must be maintained and enlarged, populations must be stabilized, and dependable supplies of food materials must be produced to place the United States in a position of preparedness, increasingly strengthened, for defense against dangers threatening the Nation either from within or from without.

During the fiscal year Federal irrigation projects were prepared to serve more than 106,000 additional acres of new land.

More than 23,000 acres of land were opened for settlement on the Sun River project in Montana and the Riverton project in Wyoming, providing new homes for approximately 260 farm families, dislocated by drought or other unfortunate circumstances. Since the Bureau was established in 1902, it has placed works in operation to serve nearly 4,000,000 acres of land which support approximately a million people. Of this total acreage approximately 2,500,000 acres were once unproductive desert, and 1,500,000 acres were in non-Federal irrigation districts which had inadequate water supplies. Under the present construction program, the largest in the Bureau's history, water will be provided for about 2,500,000 additional acres, transforming them from sagebrush wastes into productive farms that will support another million people. This will bring to 5,000,000 acres the total of new lands the Bureau has watered. Supplemental water will be supplied for about 3,500,000 acres already irrigated.



WATER FOR THE WEST.

Upper: Grand Coulee Dam on the Columbia River in Washington State, largest concrete structure in the world, nears completion under the Bureau of Reclamation program to provide electric power for national defense and farm homes for settlers in the semiarid West.

Lower: Field of wheat ready for harvest on a Wyoming Reclamation Project Farm.

bringing to almost 5,000,000 acres the lands which will have been rescued by the Federal Government supplying supplemental water. The Bureau of Reclamation estimates that as many as 20,000,000 additional acres can be irrigated with water resources as yet undeveloped and under policies now in effect. The future growth and stabilization of conditions in the West will be correlated in large measure with the conservation of these remaining water resources and their beneficial use.

Crops produced on lands served by Reclamation projects are valued at more than \$100,000,000 a year, and a market for American industry worth \$200,000,000 a year has been established. Taxable property protected by and carved out of lonely desert land by Reclamation projects totals more than \$4,500,000,000.

Power, an important byproduct of Reclamation, is essential to a well-balanced program for national defense. Defense industries in the West are depending on cheap hydroelectric power for the manufacture of such an important product as aluminum and such vital equipment as airplanes and warships. There is increasing demand for Boulder Dam power for the development of defense industries. In the event of a prolonged emergency with continued disruption of ocean transport, the United States must look to the West as its principal source of supply for most of the strategic minerals which are now largely imported for national defense and general industrial use, principally from countries now at war. Known deposits of varying extent and grade of the principal strategic minerals, the development of which might require large blocks of power for processing, are located within transmission range or economical transportation distance of Grand Coulee Dam, Shasta Dam, and Boulder Dam.

STABILIZATION OF THE GREAT PLAINS

Prolonged drought during the last decade has forced, according to reliable estimates, more than 75,000 farm families to leave the Great Plains area alone. Most of these have moved westward seeking irrigated land where they would have an assured water supply, but the irrigated land available has been inadequate to settle more than probably 5 percent of those who desire to reestablish themselves. The remainder have largely become migratory farm laborers, eking out a bare existence, or have become dependent upon relief.

Five reclamation projects, which will provide water for 52,000 acres in the Great Plains area, were approved by the President during the fiscal year and funds allocated for their construction under the Great Plains water-conservation and utilization program. This program was recommended by the Northern Great Plains Committee of the

National Resources Planning Board to aid in the rehabilitation and stabilization of the area, and thus check further migration, and make possible the return of a substantial percentage of former Great Plains farmers. The Congress included in the Interior Department Appropriation Act of 1940 an item of \$5,000,000 to assist in financing the necessary construction. This money was appropriated subject to allocation by the President to carry out the program with the assistance of moneys to be contributed by the W. P. A. from work-relief funds for expenditure largely on "relief labor." The five projects are: Buford-Trenton project in North Dakota, Second Division of the Buffalo Rapids project in Montana, Rapid Valley project in South Dakota, Mirage Flats project in Nebraska, and the Bismarck project in North Dakota. The National Resources Planning Board will help plan and coordinate the projects and the Department of Agriculture will arrange for the settlement, repayment, and operation, while the Bureau of Reclamation will build all the irrigation structures. Surveys and preliminary work were under way during the year.

The Buford-Trenton project, approved by the President in September 1939, will serve 13,400 acres in Williams County in western North Dakota on the north side of the Missouri River. Water will be obtained from the Missouri River. Principal features to be constructed are a pumping plant, 15 miles of main canal, 6 miles of laterals, and sublaterals, drains, and ditches. Electrical energy required for pumping will be obtained from a plant to be installed at Fort Peck Dam. Forage and small grains to be used in support of the livestock industry will be the main crops. The project is estimated to cost \$1,500,000, of which amount \$630,000 will be made available from the special 1940 appropriation of \$5,000,000 and the remainder, \$870,000 will be expended by the Work Projects Administration. Active construction of the project began May 6, 1940. Project headquarters of the Bureau of Reclamation are at Williston, N. Dak.

The second unit of the Buffalo Rapids project, authorized by the President in November 1939, will provide water for the irrigation of 9,800 acres on the south side of the Yellowstone River in Custer, Prairie, and Dawson counties near the towns of Shirley, Terry, and Fallon, Mont. Water will be pumped from the Yellowstone River. Land development, including the construction of farm laterals and rough land leveling will be undertaken as a part of the construction. Forage and small grains for the support of the livestock industry will be the principal crops. The estimated cost of constructing this division is \$1,450,000, of which amount \$550,000 will be obtained from the \$5,000,000 special appropriation and the remaining \$900,000 is to be provided by the Work Projects Administration. No construc-

tion work had been started at the end of the fiscal year. Headquarters of the Bureau of Reclamation are at Glendive, Mont.

The Rapid Valley project received Presidential approval in November 1939. Located on the edge of the Black Hills in the western part of South Dakota, the project will serve 12,000 acres and will cost \$2,470,000, of which amount \$980,000 is to be provided from the special 1940 appropriation and \$1,490,000 by the Work Projects Administration. Storage of water for irrigation and domestic use will be provided by the construction of an earth and rock-fill dam at the Pactola site on Rapid creek, 15 miles upstream from Rapid City. Headquarters of the Bureau of Reclamation are at Rapid City, S. Dak.

The Mirage Flats project, approved in May 1940, will serve 12,000 acres on the north bank of the Niobrara River about 11 miles south of Hay Springs, Nebr. The plan is to construct a diversion dam on the Niobrara River, about 15 miles of main canal, and a system of laterals and farm ditches. An earth and rock-fill dam will be built about 9 miles above the diversion dam to store 30,000 acre-feet of water. The project is estimated to cost \$2,560,000, of which amount \$985,000 will be repaid by the water users and the remainder will be made up of expenditures by the Work Projects Administration. Preliminary surveys have been made but no construction work has been started. Headquarters of the Bureau of Reclamation are at Hemingford, Nebr.

The Bismarck project, approved for construction in May 1940, will include 4,800 acres on the east side of the Missouri River directly south of Bismarck, N. Dak. Water for irrigation will be pumped from the Missouri River 20 feet and conveyed by 10 miles of main canal into the lateral and farm ditch system. Power for pumping will be obtained from the North Dakota Power & Light Co. The project is estimated to cost \$590,000 of which amount \$250,000 will be reimbursable from the special 1940 appropriation and the remainder will be expended by the Work Projects Administration.

Additional Projects Authorized for Construction

Two additional projects were authorized by the President for construction by the Bureau of Reclamation during the year, which when completed will provide a supplemental water supply to irrigate 1,200,000 acres of developed land.

A report, published as House Document No. 693, Seventy-sixth Congress, third session, authorizing the construction of the San Luis project on the Rio Grande in Colorado, was submitted to the Congress on April 10, 1940. This project will serve 400,000 acres of

developed land around Monte Vista in need of supplemental irrigation water. Principal construction features include Wagon Wheel Gap Dam and Reservoir, two reservoirs in the Conejos River southwest of Alamosa and a small transmountain diversion from the Colorado River Basin to the Rio Grande Basin. The project is estimated to cost \$17,465,000 and \$152,000 had been appropriated at the end of the fiscal year to begin work preliminary to construction.

A report authorizing the construction of the Kings River project in California was submitted to the Congress on February 10, 1940, and published as House Document No. 631, Seventy-sixth Congress, third session. The report contemplates a water storage project for supplemental irrigation water on about 800,000 acres of developed land, and for flood control and power development. The main construction features include the Pine Flat Dam, Reservoir, and power plant. The project is estimated to cost \$22,300,000. No funds had been appropriated for construction.

Columbia Basin Joint Investigations

Looking forward to the time in 1943 or 1944, when water may be available for the irrigation of the first block of lands included in the 1,200,000 acres ultimately to be irrigated by Grand Coulee Dam in Washington, the Bureau of Reclamation in July 1939 launched joint investigations of the Columbia Basin irrigation project. The object of the investigations is to plan for the successful settlement and development of the Columbia Basin project area, which it is expected will support an increase of 350,000 in population of the State. In November a plan for the joint investigations was set up for study which included 28 separate problems in addition to the basic engineering surveys. Participating in the studies in some capacity and in varying degrees are more than 40 agencies of the Federal, State, and local governments, educational institutions, private industry, and local civic organizations. Subjects of study range from the number and proper location of new towns or cities within the area to suitable guides for ornamental and useful tree plantings on the individual farmsteads. Considerable progress in these studies was made during the year.

Policies Regarding Opening of Lands for Settlement

Near the end of the fiscal year the Congress further clarified the historic policy of the Bureau of Reclamation with respect to offering home-making opportunities to needy farm families. It was declared that in the opening to entry of newly irrigated public lands "preference shall be given to families who have no other means of earning a livelihood, or who have been compelled to abandon, through no fault of their

own, other farms in the United States, and with respect to whom it appears after careful study, in the case of each such family, that there is probability that such family will be able to earn a livelihood on such irrigated lands." This policy emphasizes the continued need for and the progress in resettling and rehabilitating deserving American citizens. The Great Plains "relief" projects express this policy.

As irrigation works are completed and water becomes available to irrigate lands on Federal Reclamation projects, announcement of the opening of any public land is made by the Secretary of the Interior. To insure successful settlement, regulations of the Department require, among other things, that an applicant for a public farm unit must have a cash capital of at least \$2,000, or an equivalent in farm implements, livestock, or other useful assets. To meet this requirement, financial assistance was again offered prospective settlers by the extension of important legislation enacted last year authorizing the Farm Security Administration to make loans to settlers who otherwise qualified under Bureau regulations to enter a reclamation farm unit.

The 90-day preference right of entry for ex-service men on public land expired at the close of February 14, 1940, with the exception of lands which may be obtained in the future under the Boulder Canyon Project Act.

Transmission Lines

To correct a critical and complicated power situation in Wyoming and Nebraska, where generating plants on four separate Reclamation projects are in operation, an interconnecting line was being constructed, tying two power systems together, the Kendrick-North Platte systems, which already were joined, and the Riverton-Shoshone systems, which also were hooked together on a temporary basis. This 4-project hook-up is a 66,000-volt line 120 miles long extending from Casper to Thermopolis, Wyo. This will relieve a power shortage which exists on the North Platte and Kendrick projects, owing to an extremely dry year which has resulted in a shortage of water for power generation at the Seminoe Dam. A transmission line from the Seminoe power plant to Greeley, Colo., will serve, eventually, as an interconnection between the Kendrick and Colorado-Big Thompson projects.

In the Southwest also where severe and extended drought has created an extraordinary water shortage and curtailed the normal power production, the construction of transmission lines and a substation was being accelerated during the year in order to bring Boulder Dam power to central Arizona through a connection at Parker Dam with the system of the Metropolitan Water District of Southern California. In addition to the Parker-Phoenix and Parker-Blaisdell lines, the latter being necessary to supply power for the pumping of water on the Gila

project, two other lines were being considered to serve the Tucson and Coolidge areas, where serious need for Parker Dam power has developed.

Boulder Dam Power

Boulder Dam, with eight large generators and one smaller one in operation, had almost doubled its output during the fiscal year, generating 2,834,248,000 kilowatt-hours of electrical energy. The Bureau of Reclamation paid into the United States Treasury \$3,700,000. The gross income during the year, including power receipts and payments on power machinery by the lessees, totaled \$5,360,000.

Looking toward important legislation to revise certain provisions of the Boulder Canyon Project Act, hearings were held by the Congress on a bill for the adjustment of rates and charges for electrical energy generated at Boulder Dam, and for disposition of revenues derived therefrom and for other purposes.

Control and Supervision to Protect Important Structures

In connection with plans for national defense, a survey was made during the year of the control exercised and the supervision given dams, power plants, and other important structures on Reclamation projects. At Boulder Dam rigid restrictions were imposed and rangers were on duty at all times at strategic points. Generally speaking, however, there were few restrictions on visitors other than that they were barred from the work areas without special permits, and at most of the power plants they were permitted only in restricted areas and under observation of employees. Such arrangements as were thought necessary to prevent sabotage and to protect important structures were being made.

CONSTRUCTION PROGRAM

The Bureau of Reclamation continued its major construction program during the fiscal year. Work was in progress on 27 projects in 13 States.

Thirteen major storage dams and one diversion dam were under construction during the year. Of these, four storage and the one diversion dam were completed, leaving nine dams still under construction at the end of the year. Those completed were: Seminole Dam and power plant, Kendrick project, a 290-foot concrete arch dam, on the North Platte River in Wyoming; Boca Dam, Truckee River project, a 110-foot earth-fill structure on the Little Truckee River in California; Grassy Lake Dam, upper Snake River storage project, a 120-foot earth-fill dam on Grassy Creek in Wyoming; Fres-

no Dam, Milk River project, a 77-foot earth-fill dam on the Milk River in Montana; and the Roza Diversion Dam, Yakima project, a concrete gravity weir on the Yakima River in Washington.

The dams completed during the year bring to 161 the total number of dams completed by the Bureau since its origin in 1902. Of these, Shoshone, Arrowrock, Owyhee, and Boulder were each, at the time of completion, the highest in the world.

The nine dams under construction at the end of the year were: Grand Coulee Dam, Columbia Basin project, Washington, a 553-foot concrete, straight-gravity dam on the Columbia River, 83.3 percent completed; Shasta Dam, Central Valley project, California, a 560-foot concrete, straight-gravity dam on the Sacramento River, 40 percent completed; Friant Dam, also on Central Valley project, a 320-foot concrete straight-gravity dam on the San Joaquin River, 29 percent completed; Marshall Ford Dam, Colorado River project in Texas, a 270-foot concrete straight-gravity dam on the Colorado River, original contract for 190-foot low dam 97 percent completed; Green Mountain Dam, Colorado-Big Thompson project, Colorado, a 270-foot earth and rock-fill dam on the Blue River, 36 percent completed; Vallecito Dam, Pine River project, Colorado, a 150-foot earth-fill dam on the Pine River, 79 percent completed; Deer Creek Dam, Provo River project, Utah, a 240-foot earth-fill dam on the Provo River, 50 percent completed; Wickiup Dam, Deschutes project, Oregon, a 100-foot earth-fill dam on the Deschutes River, which is being constructed partly under a contract and partly by Civilian Conservation Corps forces; and Crane Prairie Dam, also on the Deschutes project a 40-foot earth-fill structure, 82 percent completed. Of these, two—Friant and Crane Prairie—were begun during the year.

Four of the storage dams under construction are of tremendous size. They are Grand Coulee, Shasta, Friant, and Marshall Ford. Grand Coulee will be the largest concrete dam in the world, while Shasta and Friant Dams will be second and fourth largest, and Marshall Ford will be fifth. Boulder Dam, although ranking first in height, is third largest.

During the fiscal year 1940 the Bureau constructed 354 miles of canals, 474.5 miles of drains, 23 tunnels with a total length of 31,430 feet, 464.4 miles of roads, 38.9 miles of railroad, 548.1 miles of transmission lines, 139.7 miles of telephone lines, 46.5 miles of pipe lines, 3,970 canal structures, 173 bridges, 824 culverts and 40 flumes. There were placed in dams 3,471,897 cubic yards of concrete, 2,951,752 cubic yards of earth, and 465,165 cubic yards of rock; and 33,348,647 cubic yards of earth and rock were excavated. A total of 4,266,131 barrels of cement were used.

Grand Coulee Dam

Grand Coulee Dam is the key control feature of the Columbia Basin project, designed to provide water for the irrigation of 1,200,000 acres of dry land in central Washington and for the generation of large blocks of cheap hydroelectric power for irrigation pumping requirements, and industrial and urban consumption. Rising to a height of 553 feet and stretching across the Columbia River 4,300 feet, the dam was nearing completion at the end of the fiscal year, with earnings under the second contract having reached 83.3 percent of the estimated contract values of \$35,476,440. Concrete in several blocks in the right abutment section were only about 6 feet below the ultimate height at elevation 1,311.08, and the lowest blocks, in the spillway section, were at elevation 1,145. With only 57.1 percent of the time elapsed, the contractor was well ahead of schedule. During the year there were placed in the dam 3,325,821 cubic yards of concrete, 22,914,993 pounds of reinforcing steel, 14,346,829 pounds of outlet conduit gates and linings, and 17,093,649 pounds of bulkhead gates, penstocks, trash racks, pipe tubing, and miscellaneous metal work.

Installation of turbines for the two initial 14,000-horsepower station service generating units was under way at the end of the year, and parts of one of the generators had been received. It was expected that these units would be ready to operate within a few months.

Excellent progress was made on the economic investigations and soil surveys of the 1,200,000 acres of irrigable land. At the end of the year retracement surveys were about 98 percent complete, topography 88 percent, classification 73 percent, and appraisal 55 percent.

The work of relocating State highways in the Columbia River reservoir area was progressing under the supervision of State highway officials. Work was started in May on construction of the Kettle Falls bridge for the Great Northern railway relocation. The work of clearing the reservoir area was continued with W. P. A. forces.

Construction of the Leavenworth station and other works in connection with the migratory fish control program were nearing completion, and will be used in caring for the 1940 runs of salmon. Construction had been started at the Entiat and Winthrop hatcheries. Transplanting of adult fish from the Columbia River to tributary streams, made necessary by the construction of Grand Coulee Dam, continued to the end of the fiscal year and will be continued, in part, until construction of works has advanced sufficiently to care for all fish under the permanent program.

Central Valley Project

During the fiscal year the construction of Shasta Dam advanced to approximately 40 percent of completion. Excavation had been nearly completed and the contractor had his plant in such a condition that the pouring of concrete could start soon after the end of the fiscal year.

The work of preparing the roadbed for the relocated railroad around Shasta Reservoir site was nearing completion. The only features on which a substantial amount of work remained to be done were the Salt Creek and O'Brien Creek Bridges, for which the erection of superstructures was about to be started, and the Pit River Bridge, for which the substructure was about one-fourth completed and the shop fabrication of the superstructure was under way.

The track on the relocated railway is being laid by the Southern Pacific Co. and most of the work in connection with the relocation of the State highway is under the direct supervision of the California division of highways.

On the Friant division construction was started on Friant Dam on the San Joaquin River, the second large dam of the Central Valley project. It is to be a straight-gravity concrete dam 320 feet high and 3,430 feet long, having a volume of 2,200,000 cubic yards. The reservoir will have a total capacity of 520,000 acre-feet. The contract was awarded on October 9, 1939, to Griffith Co. and Bent Co. on their bid of \$8,715,358, the lowest of 5 received. Construction was started on November 3, 1939. Earnings through June amounted to \$3,211,047, or 29 percent of the revised estimated cost of \$11,075,541. Work performed consisted mainly of excavation which totaled 1,588,870 cubic yards aggregate deposits and stripping pumicite deposits. The contractors' plant construction had advanced sufficiently to permit the start of concreting soon after the close of the year.

On the Delta division the three contracts for the construction of the second and third sections of the Contra Costa Canal and four canal pumping plants were completed. A transmission line to the pumping plants which was started during the year was also completed. Construction of the fourth section of the canal and the canal headworks was started and contracts covering the works were approximately 25 percent and 70 percent completed, respectively, at the end of the fiscal year.

By means of Shasta Dam in the north and Friant Dam in the south, regulation of both the Sacramento and the San Joaquin Rivers will provide adequate water to supplement the irrigation supply of a

large area of highly improved orchard and farm lands in the southern San Joaquin Valley; reestablish navigation to Red Bluff on the Sacramento River; prevent salt water intrusion in the irrigation channels of the delta of the Sacramento-San Joaquin Rivers; provide supplemental water for irrigation, domestic and industrial uses on the Walnut Creek-Martinez area, south of Suisun Bay; and make possible the generation of 375,000 kilowatts of water power at Shasta Dam.

Boulder Canyon Project

Construction at Boulder Dam during the year consisted of the erection of machinery and the installation of electrical equipment. Operating at the end of the fiscal year were eight of the large 115,000 horsepower and one smaller 55,000 horsepower units. Six of the large units, N-1 to N-6, inclusive, are in the Nevada wing and two of the large ones, A-6 and A-7, and the smaller one, A-8, are in the Arizona wing. Turbine parts for generating units A-1 and A-2 had been received and were being installed by Government forces at the end of the year. Specifications for the turbine for unit A-5 were issued in June, and generator specifications for this unit were completed and ready to be issued at the end of the month, which would leave yet to be ordered equipment for only five units, A-3, A-4, A-9, N-7, and N-8.

The 80-mile All-American Canal, by far the largest irrigation ditch in the United States, was practically completed. This canal with its 130-mile Coachella branch will carry Colorado River water to irrigate 1,000,000 acres of land in Imperial and Coachella Valleys in southern California. Drop No. 1 and Coachella turnout were completed early in the year. The contract covering the Alamo River crossing, New Briar Canal crossing and Central Main check and turnout, was completed in December. The only remaining contract, that for the clay blanketing of a section of the canal, will be completed soon after the close of the year.

Some repair work of damage caused by the earthquake in May was necessary and was performed by Government forces. An intercepting drain below the canal, to protect land of the Reservation Division of the Yuma project from seepage, was being excavated by Government forces.

Excavation of a 40-mile section of the Coachella Branch Canal was completed in March. Work under a contract for excavation and structures in the second 40-mile section was started in September and was 31 percent completed at the end of the year.

Colorado-Big Thompson Project

Construction was under way on Green Mountain Dam and the Continental Divide tunnel, two important features of the Colorado-Big Thompson project, designed to provide a supplemental water supply for 615,000 acres of land now under cultivation, situated east of the Rocky Mountains in Colorado, with water collected and stored on the western slope of the mountains in the headwaters of the Colorado River. Stored water will be transported through the Continental Divide in a 13.1-mile tunnel to the headwaters of the Big Thompson River, a tributary of the South Platte River, where it will be restored for release as needed for irrigation.

Construction of Green Mountain Dam and power plant on the Blue River was 36 percent completed on June 30.

After two unsuccessful attempts to obtain reasonable bids, the plan to construct the Continental Divide Tunnel under one contract was abandoned and, on April 8, bids were received for the excavation and installation of supports and steel liner plates of 8,000 feet of tunnel at the outlet or eastern end. The contract was awarded to S. S. Magoffin of Englewood, Colo., on April 24, at the bid price of \$471,123, the lowest of 13 received. Work was started in May and at the end of June was about 5 percent complete. Bids for similar work on a 6,600 foot section at the inlet end were received on June 20.

Marshall Ford Dam

On the Colorado River project in Texas the construction of Marshall Ford Dam to the 190-foot height was advanced to 97 percent of completion. Funds appropriated for fiscal year 1941 make possible the continuation of construction of the high dam for flood control and power generation. Bids for the construction of the addition were received on June 14. The low bid, in the amount of \$3,137,495, for the completion of the concrete section was presented by Brown & Root, Inc., and McKenzie Construction Co., that for the construction of the earth embankment portion of the dam was presented by Cage Bros. and W. W. Mann & Co. in the amount of \$903,102.

By enlarging the dam, a reservoir of 3,120,000 acre-feet capacity will be provided, to be used jointly for flood control, power, and river regulation to augment the low water flow for irrigation purposes along the Colorado River below Austin.

Other Construction

On the Roza Division of the Yakima project, Washington, where 72,000 acres will be irrigated, approximately 41 miles of the 99-mile canal, including five tunnels totaling about 24,000 feet, a 1,500-foot concrete siphon under the Yakima River, and 1.3 miles of bench flume had been completed at the end of June. Construction of wasteways Nos. 2 and 3 was well under way.

The 27-mile Black Canyon Canal, the "A" line and "D" line branch canals, several wasteways and the entire lateral system to serve 27,000 acres of gravity lands had been completed for the Payette Division of the Boise Project in Idaho. This division will add 50,000 acres to one of the oldest and largest Federal Reclamation projects. Some of the land is public land which will be open for settlement.

Twenty-three miles of the 28-mile Heart Mountain Canal had been completed for the Heart Mountain Division of the Shoshone project in Wyoming, comprising approximately 41,000 acres of irrigable land. During the year work was started on the control works at Shoshone Dam and on the construction of 40 miles of laterals. These contracts were respectively 80 percent and 21 percent completed at the end of the year.

On the Gila project in Arizona, the Gravity Main Canal was completed to carry water diverted from the Colorado River at Imperial Dam to 150,000 acres comprising the first unit of the project, most of which is public land that will later be opened for settlement. Bids had been opened for the construction of the first pumping plant, located a distance of 21 miles from the dam. Equipment had been ordered.

Three major contracts were awarded in January for the construction of a 25-mile section of the 67-mile Conchas Canal, Tucumcari project, which will carry water stored by Conchas Dam for the irrigation of 45,000 acres of agricultural land in northeastern New Mexico. Good progress had been made on the work to the end of the year. Another section of canal was being constructed with W. P. A. forces and a good start had been made on this work.

On the Kendrick project in Wyoming the main canal to mile 62.5 had been completed, as had about 50 percent of the 250 miles of lateral system to serve the first unit of 40,000 acres. Construction of one drain was started. The main electrical transmission lines of the project were all completed at the end of the year.

Two major transmission lines were constructed from Parker Dam, Arizona-California, one to Phoenix and the other to Blaisdell in the vicinity of Yuma. Construction of the power plant at Parker Dam

was started and equipment ordered for three of the four 30,000-kilowatt units proposed for ultimate installation.

At the Elephant Butte Dam, Rio Grande project, the powerhouse building was completed and equipment was being installed. The plant has a total installed capacity of 24,300 kilowatts consisting of three 8,100-kilowatt units. Construction of the 62.5-mile transmission line to Las Cruces was started in June.

Other regular projects on which work was under way during the year were Carlsbad in New Mexico, Riverton in Wyoming, Sun River in Montana, Uncompahgre in Colorado, and Upper Snake River Storage, Idaho-Wyoming.

CUMULATIVE CONSTRUCTION RESULTS

In the 38 years of its existence, the Bureau of Reclamation has completed the following construction: 161 storage and diversion dams; 51 powerhouses; 3,058 buildings; 20,575.9 miles of canals, ditches, and drains; 878 miles of tunnels; 4,802.5 miles of telephone lines; 300.5 miles of dikes; 6,377 flumes; 21,525 culverts; 13,912 bridges; and 202,491 other irrigation structures.

Reservoirs of the Bureau of Reclamation had a combined capacity of 51,215,000 acre-feet at the end of the fiscal year.

POWER

The completion of the Seminole power plant of the Kendrick project brought to 24 the number of power plants which were operated on Bureau of Reclamation projects during the fiscal year. The plants are located on 14 projects. Their total output during the year was 3,295,510,126 kilowatt hours, of which 3,211,355,677 kilowatt-hours were sold, resulting in gross revenues of \$7,866,994.76. Of this the Boulder power plant accounted for \$4,461,393.89 from 2,801,703,774 kilowatt-hours sold out of 2,834,248,000 kilowatt-hours generated.

The Seminole power plant is located at the toe of Seminole Dam on the North Platte River in Wyoming. It has an installation of three 10,800 kilowatt units and will have an average annual output of 140,000,000 kilowatt-hours of energy. Transmission lines have been constructed to Casper, Rawlins, and through Laramie to Cheyenne, from where branch lines extend to Gering, Nebr., and Greeley, Colo. Delivery of power from the plant was started in August 1939.

The eighth large generator was placed in service at the Boulder power plant in September 1939. Turbines for the ninth and tenth units were being installed at the end of the year and specifications for the turbine for the eleventh were issued in June.

Three 30,000 kilowatt units for the Parker power plant were ordered in February. These were expected to be ready to operate in the Fall of 1941. Contracts had been completed or were being negotiated which would utilize the full capacity of the three units, and there is sufficient market to justify the immediate installation of the fourth unit.

The Elephant Butte power plant on the Rio Grande project was nearing completion and will be placed in operation during the fall of 1940. Contracts had been completed or were being negotiated which would utilize the 90,000,000 kilowatt-hours of energy to be available annually.

The station service units at the Grand Coulee power plant, Columbia Basin project, will start operating during the fall of 1940. Three of the main units had been ordered. Power plants were also under construction by the Bureau of Reclamation at Shasta Dam, Central Valley project, and Green Mountain Dam, Colorado-Big Thompson project. At Marshall Ford Dam, in Texas, the Lower Colorado River Authority is installing the power plant.

RECLAMATION FUND

Accretions to the reclamation fund remained at a low level as will be indicated by the table below:

Accretions to Reclamation Fund, by States

States	Sale of public lands		Proceeds from Oil Leasing Act		Total to June 30, 1940
	Fiscal year 1940	To June 30, 1940	Fiscal year 1940	To June 30, 1940	
Alabama.....			\$3, 207. 75	\$191, 373. 16	\$191, 373. 16
Arizona.....	\$4, 035. 97	\$2, 729, 300. 41	1, 907. 78	2, 067. 98	2, 731, 368. 39
California.....	3, 507. 44	8, 234, 042. 67	1, 067, 919. 37	18, 396, 421. 51	26, 630, 464. 18
Colorado.....	2, 920. 80	10, 301, 694. 15	57, 640. 72	822, 693. 15	11, 124, 387. 30
Idaho.....	4, 122. 68	7, 033, 745. 11	99. 06	21, 046. 85	7, 054, 791. 96
Kansas.....	35. 52	1, 033, 461. 91	104. 38	219. 88	1, 033, 681. 79
Louisiana.....			39, 711. 53	276, 996. 42	276, 996. 42
Mississippi.....				11. 55	11. 55
Montana.....	1, 938. 60	15, 371, 319. 48	51, 129. 98	1, 362, 673. 72	16, 733, 993. 20
Nebraska.....	283. 24	2, 095, 022. 65	73. 50	147. 00	2, 095, 169. 65
Nevada.....	420. 38	1, 033, 949. 54	82. 57	5, 614. 22	1, 039, 563. 76
New Mexico.....	4, 659. 59	6, 712, 871. 11	386, 063. 26	2, 185, 854. 85	8, 898, 725. 96
North Dakota.....	95. 65	12, 219, 916. 28	9, 138. 51	188, 940. 93	12, 408, 857. 21
Oklahoma.....	9. 60	5, 929, 742. 17	22. 84	22. 84	5, 929, 765. 01
Oregon.....	1, 912. 73	11, 996, 340. 61		186. 82	11, 996, 527. 43
South Dakota.....	215. 56	7, 734, 392. 90	501. 45	3, 310. 22	7, 737, 703. 12
Utah.....	2, 730. 28	4, 366, 302. 07	62, 567. 86	743, 575. 22	5, 109, 877. 29
Washington.....	415. 47	7, 462, 423. 40	1, 525. 38	35, 275. 01	7, 497, 698. 41
Wyoming.....	4, 259. 03	8, 695, 462. 84	818, 866. 23	36, 992, 284. 12	45, 687, 746. 96
Total.....	31, 562. 54	112, 949, 987. 30	2, 500, 562. 17	61, 228, 715. 45	174, 178, 702. 75
Proceeds, Federal water power licenses.....					1 828, 455. 07
Proceeds, potassium royalties and rentals.....					2 657, 555. 67
Receipts from Naval Petroleum Reserves, 1920 to 1938, act of May 9, 1938.....					29, 778, 300. 23
Grand total.....					205, 443, 013. 72

¹ Proceeds for fiscal year, \$25,864.16.

² Proceeds for fiscal year, \$156,800.09.

The effect of the provision that repayments of allotments made from emergency funds to reclamation projects be deposited in the reclamation fund has not as yet been felt, and it is not expected to be felt for several years, owing to the fact that the projects on which this money was expended, for the most part, are not completed.

As a consequence, it is anticipated that by the close of the 1942 fiscal year the reclamation fund will be so depleted that it will be unable to carry the construction of all the projects now being financed from the fund. Two means of correcting this situation, which soon may become critical, are suggested. Either the reclamation fund should be increased by an advance from the General Fund of the Treasury, or certain of the more costly of the projects now being constructed by appropriations from the fund should be financed by appropriations from the General Fund of the Treasury or in other ways.

Repayments

Construction payments during the year totaled \$2,293,980.25; operation and maintenance collections amounted to \$1,101,522.51; and water rental receipts were \$503,549.67. Arrearages at the close of the fiscal year were: Construction, \$1,442,705.95; operation and maintenance, \$243,645.43; and water rental, \$171,526.85; amounts which represent slight increases over comparable figures for the previous year. Operation of the Reclamation Project Act of 1939 in future years should largely correct situations resulting in such delinquencies.

Status of Reclamation Fund

Accretions to the fund:

Sales of public lands.....	\$112, 949, 987. 30
Royalties and rental under Mineral Leasing Act.....	61, 228, 715. 45
Potassium royalties and rentals.....	657, 555. 67
Federal water-power licenses.....	828, 455. 07
Receipts from Naval Petroleum Reserves, 1920 to 1938, act of May 9, 1939.....	29, 778, 300. 23
Total accretions.....	205, 443, 013. 72
Collections—construction and operation and maintenance repay- ments, water rentals, power and light, etc.....	129, 503, 277. 60
Total cash available.....	334, 946, 291. 32
Disbursements.....	318, 592, 492. 40
Balance in fund June 30, 1940.....	16, 353, 798. 92

Accounts Receivable, Construction Water-right Charges

State and project	Due		Collected			Uncollected, June 30, 1940
	Fiscal year 1940	To June 30, 1940	Cash		Other credits to June 30, 1940	
			Fiscal year 1940	To June 30, 1940		
Arizona:						
Salt River.....	\$50,000.00	\$7,449,318.81	\$50,000.00	\$7,449,318.81		
Yuma Auxiliary.....	2,395.29	578,413.91	3,123.46	576,398.95	\$1,764.14	\$250.82
Arizona-California:						
Yuma.....	144,942.69	4,642,567.35	71,111.00	3,799,949.16	767,248.14	75,370.05
California: Orland.....	27,627.95	882,051.08	22,110.45	849,361.18		32,689.90
Colorado:						
Grand Valley.....	55,666.18	364,432.50	28,951.54	170,805.07	193,111.45	515.98
Uncompahgre.....	78,430.36	774,040.88	16,436.07	498,870.50	66,735.02	208,435.36
Idaho:						
Boise.....	298,627.53	4,945,330.16	295,238.55	4,907,525.31	27,193.29	10,611.56
Minidoka.....	145,428.77	9,059,281.25	204,762.54	7,951,405.52	931,715.18	176,160.55
Upper Snake River.....	35,750.00	35,750.00				35,750.00
Montana:						
Bitter Root.....	¹ 26,913.05	81,453.73	27,341.76	81,453.73		
Frenchtown.....	1,250.00	1,250.00	625.00	625.00		625.00
Huntley.....	17,337.28	624,119.89	16,442.95	525,195.06	98,069.65	855.18
Milk River.....	18,853.15	190,817.17	26,780.59	85,385.55		105,431.62
Sun River.....	32,365.64	377,917.96	22,116.23	314,782.08	49,042.65	14,093.23
Montana-North Dakota:						
Lower Yellowstone.....	72,242.05	537,475.42	66,482.86	494,727.08	1,811.45	40,936.89
Nebraska-Wyoming:						
North Platte.....	299,142.25	5,140,789.85	108,083.66	3,176,325.36	1,906,458.55	58,005.94
Nevada: Newlands.....	85,960.22	1,458,095.71	80,780.94	1,358,023.73	95,643.17	4,428.81
New Mexico: Carlsbad.....	14,474.24	932,558.09	15,625.46	925,267.26	81.25	7,209.58
New Mexico-Texas: Rio Grande.....	244,761.53	4,017,790.79	114,326.94	3,401,997.88	615,792.91	
Oregon:						
Baker.....	5,769.50	20,193.25	5,769.50	20,193.25		
Burnt River.....	7,500.00	7,500.00	7,500.00	7,500.00		
Stanfield.....	2,508.47	2,508.47	2,508.47	2,508.47		
Umatilla.....	14,758.31	664,629.03	2,660.39	414,746.74	5,669.44	244,212.85
Oregon-California: Klamath.....	90,259.46	1,445,471.16	102,206.74	1,409,783.94	7,948.25	27,738.97
Oregon-Idaho: Owyhee.....	10,000.00	10,000.00	9,914.52	9,914.52		85.48
South Dakota: Belle Fourche.....	¹ 39,092.74	716,744.46	14,491.56	604,168.35	83,856.55	28,719.56
Utah:						
Hyrum.....		23,250.00				23,250.00
Salt Lake Basin.....	88,192.90	392,856.39	88,192.90	392,856.39		
Sanpete.....	2,375.00	2,375.00	2,375.00	2,375.00		
Strawberry Valley.....	79,408.63	1,633,965.54	78,658.63	1,620,077.32	13,888.22	
Washington:						
Okanogan.....	¹ 10,000.00	148,327.74		138,327.74		10,000.00
Yakima.....	259,290.22	8,003,892.61	338,825.67	7,580,494.87	86,668.41	336,729.33
Wyoming: Shoshone.....	46,509.61	1,146,923.87	45,148.98	978,495.04	167,829.54	599.29
Total.....	2,155,821.44	56,312,092.07	1,868,592.36	49,748,858.86	² 5,120,527.26	1,442,705.93
Paid in advance of due dates.....			27,851.89	389,540.35	³ 220,529.34	
Refunds.....				100,225.10	3,212.84	
Total collections.....			1,896,444.25	50,238,624.31		
Contributed funds applying to construction cost not included in above table.....			54,900.00	2,101,258.83		

¹ Contra.² Other credits for fiscal year, \$425,387.89.³ Decrease for fiscal year, \$7,177.64.

Accounts Receivable, Operation and Maintenance Charges (After Public Notice)

State project	Due		Collected			Uncollected, June 30, 1940
	Fiscal year 1940	To June 30, 1940	Cash		Other credits to June 30, 1940	
			Fiscal year 1940	To June 30, 1940		
Arizona: Yuma auxiliary	\$13,250.09	\$546,702.19	\$12,524.83	\$528,575.02	\$13,816.35	\$4,310.82
Arizona-California: Yuma	153,453.66	4,486,724.70	134,837.80	4,265,931.13	197,841.63	22,951.94
California: Orland	36,291.35	779,626.38	35,517.06	737,402.86	25,757.82	16,465.70
Colorado:						
Grand Valley	49,994.21	606,989.59	49,994.21	573,989.59	33,000.00	
Uncompahgre		1,008,683.69		977,809.79	30,873.90	
Idaho:						
Boise	11,912.95	2,237,040.24	11,912.95	2,184,390.52	52,649.72	
King Hill		60,711.27		59,192.22	1,519.05	
Minidoka	57,065.21	2,377,951.46	44,067.72	2,204,578.64	141,715.43	31,657.39
Upper Snake River	10,000.00	10,000.00	9,952.33	9,952.33		47.61
Montana:						
Huntley		554,787.34		543,594.31	11,193.03	
Milk River	52,404.14	575,530.88	51,559.09	545,084.40	1,662.25	28,784.23
Sun River	131.23	168,687.27	131.23	164,335.05	4,352.22	
Montana-North Dakota:						
Lower Yellowstone		338,562.56		338,557.93	4.63	
Nebraska-Wyoming:						
North Platte	24,149.50	2,027,258.50	23,437.90	1,949,150.45	67,220.63	10,887.43
Nevada: Newlands		1,174,581.57		1,135,901.55	38,680.02	
New Mexico: Carlsbad	46,690.17	1,132,514.86	46,690.17	1,115,642.15	16,872.71	
New Mexico-Texas: Rio Grande	280,091.94	5,576,473.13	265,828.50	5,295,346.37	281,126.76	
North Dakota:						
Buford-Trenton		2,317.41		2,317.41		
Williston		34,042.75		34,042.75		
Oregon:						
Umatilla	3,258.97	402,034.66	3,893.27	394,770.86	7,253.96	9.84
Vale	25,131.54	109,546.93	25,131.54	109,546.93		
Oregon-California: Klamath	63,228.66	1,565,609.95	63,233.70	1,530,944.71	30,536.22	4,129.02
Oregon-Idaho: Owyhee	3,643.44	42,917.21	3,643.44	42,917.21		
South Dakota: Belle Fourche	64,000.00	1,449,787.28	64,000.00	1,440,411.29	9,375.99	
Utah: Strawberry Valley		376,880.88		365,022.21	11,858.67	
Washington:						
Okanogan		371,441.72		368,788.67	2,653.05	
Yakima	245,374.25	6,540,887.18	240,866.24	6,341,566.63	76,870.11	122,450.44
Wyoming: Shoshone	3,892.51	567,941.18	3,262.29	542,284.80	23,705.43	1,950.95
Total	1,136,514.48	35,126,232.78	1,083,034.93	33,802,047.78	2,080,539.57	243,645.43
Paid in advance of due dates			50,465.43	215,425.64	10,626.10	
Penalties and interest			7,108.08	549,308.88	20,503.43	
Refunds				38,241.47	156.00	
Total collections			1,140,608.44	34,605,023.77		

¹ Contra.² Other credits for fiscal year, \$18,487.58.³ Decrease for fiscal year, \$4,244.61.⁴ Increase for fiscal year, \$3.54.

Accounts Receivable, Rentals of Irrigation Water

State project	Due		Collected			Uncollected June 30, 1940
	Fiscal year 1940	To June 30, 1940	Cash		Other credits to June 30, 1940	
			Fiscal year 1940	To June 30, 1940		
Arizona:						
Salt River.....		\$2, 246, 726. 01		\$2, 246, 726. 01		
Yuma Auxiliary.....	\$1, 620. 02	18, 548. 48	\$877. 45	17, 048. 48	\$1, 500. 00	
Arizona-California:						
Yuma.....	6, 375. 73	590, 871. 60	5, 977. 73	577, 772. 41	12, 654. 19	\$445. 00
Central Valley.....	8, 700. 00	8, 700. 00				8, 700. 00
California: Orland.....	207. 12	121, 890. 29	207. 12	121, 890. 29		
Colorado:						
Fruit Growers Res.....	2, 500. 00	2, 500. 00	2, 500. 00	2, 500. 00		
Grand Valley.....	10, 896. 22	566, 432. 28	9, 921. 22	558, 956. 61	6, 500. 67	975. 00
Uncompahgre.....	2, 167. 36	1, 237, 948. 68	1, 036. 24	1, 223, 748. 22		14, 200. 46
Idaho:						
Boise.....	8, 050. 00	838, 238. 57	8, 050. 00	833, 518. 07	4, 720. 50	
Boise-Payette.....	30, 696. 71	32, 185. 26	16, 812. 94	18, 118. 49		14, 066. 77
Minidoka.....	59, 464. 99	973, 083. 99	60, 014. 99	968, 525. 98	3, 383. 01	1, 175. 00
Montana:						
Huntley.....	521. 87	14, 640. 70	521. 87	14, 640. 70		
Milk River.....	628. 37	239, 701. 07	628. 37	229, 754. 43	1, 208. 14	8, 738. 50
Sun River.....	44. 71	132, 714. 64	93. 09	130, 852. 31	1, 366. 62	495. 71
Montana-North Dakota: Lower Yellowstone.....	765. 00	138, 974. 00	372. 60	137, 523. 38		1, 450. 62
Nebraska-Wyoming: North Platte.....	2, 397. 75	356, 565. 92	2, 397. 75	356, 555. 92	10. 00	
Nevada: Newlands.....		28, 291. 16		22, 114. 31	6, 176. 85	
New Mexico:						
Carlsbad.....	100. 00	41, 392. 59	100. 00	41, 392. 59		
Hondo.....		9, 129. 70		9, 129. 70		
New Mexico-Texas: Rio Grande.....	149, 542. 92	1, 843, 294. 23	154, 819. 29	1, 827, 794. 23		15, 500. 00
North Dakota:						
Buford-Trenton.....		31. 75		31. 75		
Williston.....		2, 117. 28		2, 117. 28		
Oregon:						
Umatilla.....	2, 230. 55	106, 934. 32	2, 230. 55	80, 657. 52		26, 276. 80
Vale.....	1 63. 06	21, 509. 15	91. 77	21, 509. 15		
Oregon-California: Klamath.....	57, 758. 60	620, 637. 01	57, 502. 36	614, 548. 71	25. 00	6, 063. 30
Oregon-Idaho: Owyhee.....	96, 448. 86	326, 662. 78	112, 069. 31	308, 783. 58		17, 879. 20
South Dakota: Belle Fourche.....	425. 55	12, 571. 00	695. 85	12, 553. 20	17. 80	
Utah: Strawberry Valley.....		17, 596. 13		17, 596. 13		
Washington:						
Okanogan.....		110, 645. 28		108, 061. 09	2, 584. 19	
Yakima.....	20, 143. 04	245, 846. 06	2, 186. 80	186, 662. 97	4, 082. 69	55, 100. 40
Wyoming:						
Riverton.....	48, 496. 36	223, 459. 77	46, 534. 93	208, 439. 81	14, 656. 25	363. 71
Shoshone.....	14, 512. 86	152, 368. 36	14, 268. 55	148, 222. 32	4, 049. 66	96. 38
Total.....	524, 631. 53	11, 282, 208. 06	499, 910. 78	11, 047, 745. 64	2 62, 935. 57	171, 526. 85

¹ Contra.² Other credits for fiscal year, \$3,638.89.

POPULATION OF THE PROJECTS

There was a slight increase during the past year in the number of farms irrigated, bringing the total to 53,205. The population on these farms was 227,835. The 1940 census made possible the revision of population figures for the 258 towns on or directly tributary to the projects, which, with the elimination of one duplication, gives a corrected figure of 609,782 as compared to 676,928 in 1939. The combined population of these towns and the irrigated farms is 837,617.

Within the areas thus developed as the result of the construction of the Federal irrigation systems there have been established 937 schools and 1,148 churches. There were 108 banks serving the settlers of the project farms and towns.

Settlement and Economic Data, Fiscal Year 1940

State	Project	Irrigated farms		Towns on or tributary to the project		Number of schools	Number of churches	Banks			
		Number	Population	Number	Population			Number	Capital stock	Deposits	Number of depositors
Arizona	Salt River	9,000	68,000	12	85,957	91	152	8	2,594,100	\$42,488,864	45,957
Arizona-California	Yuma	1,592	3,337	5	8,700	13	27	1	550,000	1,662,857	2,095
California	Orland	679	2,048	1	1,362	9	10	1	(1)	968,526	2,967
Colorado	Grand Valley	526	1,672	6	19,950	17	38	3	275,000	4,360,400	8,100
	Uncompahgre	1,714	6,355	3	8,900	28	37	4	325,000	3,720,814	7,182
Idaho	Boise	4,050	16,000	16	50,579	118	130	4	(1)	(1)	(1)
	Minidoka	3,499	11,755	10	14,840	34	70	7	(1)	(1)	(1)
Montana	Bitter Root	337	1,901	5	6,000	18	13	4	140,000	1,915,689	4,350
	Frenchtown	35	150	2	130	2	1	0	0	0	0
	Huntley	630	1,793	5	814	8	6	1	25,000	170,551	300
	Milk River	691	2,684	17	11,605	33	36	7	290,000	4,318,336	7,770
Montana-North Dakota	Sun River	805	2,387	5	1,096	7	11	1	25,000	207,000	650
Nebraska	Lower Yellowstone	676	3,595	7	4,155	18	22	2	80,000	1,150,000	2,600
Nebraska-Wyoming	North Platte	3,163	9,936	17	23,196	71	46	9	405,000	6,225,981	12,650
Nevada	Humboldt	56	230	1	1,290	4	4	1	60,000	992,606	1,300
	Newlands	729	2,683	4	2,298	16	12	1	0	946,000	1,555
	Truckee Storage	425	1,800	2	26,566	25	19	4	700,000	21,268,726	19,674
New Mexico	Carlsbad	461	2,200	4	9,750	8	12	2	100,000	1,894,088	2,975
New Mexico-Texas	Rio Grande	5,990	25,458	36	125,029	88	128	6	775,000	39,558,947	34,222
Oregon	Umatilla	459	1,631	5	1,655	7	12	1	25,000	415,591	1,322
	Vale	439	1,680	3	1,600	5	12	1	25,000	(1)	(1)
Oregon-California	Klamath	936	2,732	5	27,458	30	35	5	(1)	(1)	(1)
Oregon-Idaho	Owyhee	1,706	6,630	5	7,300	28	23	2	(1)	(1)	(1)
South Dakota	Belle Fourche	900	2,265	5	3,699	28	17	3	(1)	(1)	(1)
Utah	Hyrum	516	1,500	3	3,709	5	5	0	0	0	0
	Moon Lake	600	2,550	5	2,045	15	23	1	46,000	442,000	1,600
	Ogden River	1,109	3,500	6	50,525	25	56	4	698,000	21,643,000	30,000
	Sanpete	210	1,160	2	3,087	7	6	1	70,000	504,000	850
	Strawberry Valley	1,800	7,500	11	14,000	22	20	3	165,000	2,444,022	6,927
Washington	Weber River	2,100	10,000	12	9,492	46	50	7	680,000	21,450,000	25,000
	Okanogan	373	944	3	4,735	9	8	2	75,000	1,166,812	2,585
	Yakima	5,442	17,400	23	51,826	78	62	8	1,900,000	7,235,647	13,634
Wyoming	Kendrick	0	0	4	21,000	17	23	2	500,000	9,217,811	12,000
	Riverton	495	1,730	3	2,627	3	13	1	50,000	540,300	1,300
	Shoshone	1,071	2,629	5	2,207	3	9	1	35,000	645,069	1,400
Total		53,205	227,835	258	609,782	937	1,148	108	10,613,100	200,268,411	255,465

1 Data not reported.

OPERATION AND MAINTENANCE

The usual operation and maintenance work was continued on all of the government projects, 25 of which are under the supervision of water users' organizations and 16 remain under the care of the Bureau. The cost of operation and maintenance on practically all projects is covered by funds advanced by water users. With few exceptions the Bureau has retained the care and operation of storage dams and reservoirs.

In addition to routine activities connected with the delivery of water to the project farms, educational work had been continued for the purpose of bringing about more economical and efficient use of water by limiting the supply to that which is required for maximum crop production and thereby avoiding the seepage of cultivated areas, the leaching of valuable plant food and soil erosion. This had been accomplished chiefly through the use of motion pictures presented in cooperation with water users' organizations, State Colleges, and county agricultural agents.

Investigations had been continued for the purpose of finding a cheap and efficient method of reducing the loss of water as it flows through canals from the point of diversion to the irrigated farms. Concrete is effective but expensive. The experience that had been gained in the use of bentonite, a kind of clay that swells several times its original volume when wet, indicated that this material could be used to advantage in canals excavated in porous sand and gravel. Satisfactory results can be obtained for reasonable costs, there being many deposits of this clay in the western section of the United States.

The eradication of noxious weeds continued to receive a good deal of attention and encouraging results had been obtained on several of the projects through the efforts of local officials in organizing weed districts and in carrying on energetic and effective weed control campaigns. Studies were continued to determine the best methods of controlling perennial weeds that were classified by law as noxious in nearly all of the western states. Educational work in the control of weeds was also carried on in part by the use of moving pictures.

LANDS OPENED TO HOMESTEAD ENTRY

During the fiscal year three blocks of land on two projects were opened to homestead entry. These gave opportunity for the settlement of 260 farm units with an irrigable area of 23,540 acres. On November 28, 1939, 39 units on the Riverton project, in Wyoming, were made available to qualified applicants, and on the Sun River project, in Montana, two public notices were issued, one of October 25, 1939, opening 81 farm units, and the second one opened 140 additional units

on April 22, 1940. The Farm Security Administration, as authorized by the Act of August 7, 1939, has cooperated in connection with all three of these openings by furnishing financial assistance to worthy applicants who were otherwise qualified under departmental regulations to enter a reclamation farm unit. In all three cases more applications were received prior to the date of opening than there were farms available. There has been a constant demand for public land farms, and plans were being made at the end of the year for the initial public notice covering lands on the newly constructed portion of the Payette division of the Boise project, Idaho, where 46 units were soon to be ready for homestead entry. The provisions of the act of August 7, 1939 have been extended so that financial assistance can be given to settlers throughout the fiscal year 1941.

REPAYMENT LEGISLATION

Of great importance is the Reclamation Project Act of 1939 (Public, No. 260, 76th Cong.) enacted into law August 4, 1939. This act provides specific measures for adjusting the economic and financial problems that have arisen on Federal reclamation projects. It makes possible the drafting of new contracts gearing repayments to the ability year by year of the farmers to make payments, the reclassifying of lands from time to time, and the accomplishment of other needed reforms.

In section 3 of this act provision is made for granting an extension of time for the payment of construction charges, where justified, of not more than 40 years from the date of the first installment or not to exceed double the number of remaining years. Section 4 provides for an adjustment of annual charges based upon the normal and percentage plan, with an increase or decrease in payments as crop values increase or decrease from normal values. Where adequate relief cannot be granted under the provisions of sections 3 or 4, the act provides, in section 7, for the negotiation of new contracts which will provide for fair and equitable treatment of the repayment problems, but such contracts may be executed on behalf of the United States only after approval thereof has been given by act of Congress. There are a few projects where adjustments can be made under the provision of section 3, a few more under section 4, but most of the projects where some measure of relief is needed will have to be considered under the provisions of section 7.

Section 8 of the 1939 act authorizes the Secretary to reclassify the irrigable land where justified. Requests had been received and plans made to reclassify the irrigable lands on 10 or more projects or divisions of projects during the season of 1940. One-half of the

estimated cost of reclassification must be advanced by the water users.

For the purpose of obtaining the views of a committee familiar with irrigated farming, a majority of whose members are not directly connected with the Bureau of Reclamation, the Secretary selected Mr. William Peterson, director of extension service, Utah Agricultural College; Dr. Wilbur L. Powers, soil scientist, Oregon State College; and Mr. B. E. Hayden, project superintendent, Bureau of Reclamation, Klamath project, Oregon, to visit certain projects, study the economic and financial conditions and report to the Secretary. This committee did not start on investigations until after the close of the fiscal year, but will visit and submit reports on 11 Federal projects. There will probably be about 25 projects where readjustments will have to be made, most of which will have to be handled under the provisions of section 7.

This new legislation should obviate the necessity in the future of extending blanket moratoria on repayments, even under severely depressed conditions.

RELIEF EXTENDED TO WATER USERS

The act of May 31, 1939 (Public, No. 97, 76th Cong.) authorized the Secretary to extend relief to water users who were unable to pay, without great hardship, construction charges for the calendar year 1938 and prior years. Section 17 (b) of the Reclamation Project Act of 1939 extended the provisions of the act of May 31 whereby the Secretary could grant relief in the payment of construction charges for each of the years 1939 to 1943, inclusive. Pursuant to this authority the Secretary has granted relief in the payment of construction charges for 1939 to 17 districts amounting to \$528,222.13. Approximately one-half of this sum is confined to two projects which heretofore have promptly paid their contract obligations, one being the Salt River project in Arizona where relief was granted because of a serious shortage in the water supply for 1939, and the other, the Imperial Irrigation District of California, where excessive rainfall and floods in September 1939 caused extensive damage to the canal system.

CROP RESULTS

The average value per acre in the calendar year 1939 of crops on Government reclamation projects was \$37.06 which is 25 cents less than in 1938. There were some slight increases in the area in cultivation, from 3,040,695 in 1938 to 3,078,072 in 1939, but nearly all of the increase of 37,377 acres resulted from the addition of Burnt River and Stanfield projects in Oregon, and the Humboldt project

in Nevada, which appear in the crop tabulation for the first time and are carried in the column headed, "Projects furnished supplemental water." The Bureau was prepared to supply water to 3,889,540 acres in 1939, or an increase of 106,607 acres over 1938, chiefly owing to the completion of certain projects and extension of the canal system on other projects. The total value of crops on all projects was \$114,082,794, an increase of \$619,334 over 1938.

The water shortage on the Belle Fourche project in South Dakota continued through 1940 and less than half of the quantity required for the production of good crops was available for the cultivated acreage. The Salt River project in Arizona also experienced a water shortage but was able to come through the season by drawing on underground water which was pumped from wells and by making very careful use of the available supply.

Irrigation and Crop Results on Federal Reclamation Projects, 1939—Continued

State	Projects and divisions	Projects constructed by Bureau				Projects furnishing supplemental water				Projects furnished water under Warren Act			
		Irrigable acreage	Area in cultivation classes 1-4	Crop values		Irrigable acreage	Area in cultivation classes 1-4	Crop values		Irrigable acreage	Area in cultivation classes 1-4	Crop values	
				Total	Per acre			Total	Per acre			Total	Per acre
Oregon-Idaho	Owyhee.....	Acres 100,089	Acres 73,345	\$1,856,611	\$22.31		Acres			Acres 13,960	Acres 11,690	Acres \$840,360.0	\$22,999
	Advancement Irrigation District.....	683	609	15,124	44.83								
	Bench Irrigation District.....	2,312	2,174	90,235	21.51								
	Crystal Irrigation District.....	1,207	1,058	29,025	17.43								
	Owyhee Irrigation District.....	56,600	38,929	747,490	49.20								
	Payette-Oregon Slope Irrigation District.....	4,432	3,597	154,210	2.87								
	Ontario-Nyssa Irrigation District.....	5,690	4,936	175,882	35.63								
	Gem Irrigation District.....	29,041	21,442	630,010	29.38								
	Slide Irrigation District.....	1,124	600	14,635	24.39								
South Dakota Utah	Belle Fourche.....	72,746	34,222	821,222	24.00								
	Weber River (Salt Lake Basin).....			89,484				86,984	\$3,670.291				
	Hyrum.....			8,329				5,948	200,687				
	Ogden River.....			18,549				11,940	487,655				
	Snapete.....			12,750				10,811	115,638				
	Ephraim Division.....							6,750	5,833				
	Spring City Division.....							6,000	4,978				
	Strawberry Valley.....	41,205	38,577	871,611	22.59					6,269	5,929	150,176	25.33
Washington	Highline Division.....	19,012	17,780	301,717	16.97								
	Spanish Fork Division.....	13,904	13,235	310,392	23.45								
	Springville-Mapleton Division.....	8,289	7,562	259,502	34.32								
	Okanogan.....	5,356	3,369	361,074	107.17								
	Yakima.....	205,156	166,622	7,756,446	46.55					188,677	157,376	7,534,111	47.87
	Sunnyside Division.....	105,433	84,684	3,188,272	37.65								
	Tieton Division.....	29,537	24,920	3,252,242	130.51								
	Kittitas Division.....	70,186	57,018	1,315,932	23.08								

SECONDARY AND GENERAL INVESTIGATIONS

Investigations of 100 potential projects were in progress during the fiscal year by the Bureau of Reclamation. Allotments of emergency funds and regular appropriations were being used.

The investigations are generally limited to (a) examinations of individual projects, including land classification, reservoir and canal surveys, economic and water-supply studies, (b) reconnaissance surveys of stream basins to determine irrigation potentialities within those basins, and (c) basin-wide surveys, including reconnaissance and examination of individual projects within the basin. The largest and practically the only basin-wide survey undertaken by the Bureau is that of the Colorado River Basin, the examination of which was authorized by section 15 of the Boulder Canyon Project Act approved December 21, 1928, which directs that investigation and public reports be made of the feasibility of projects for irrigation, generation of electrical power, and other purposes in the States of Arizona, Nevada, Colorado, New Mexico, Utah, and Wyoming. The status of progress is given in the following paragraphs.

Arizona**Colorado Basin surveys:**

Little Colorado River: Land classification and reservoir surveys, except geological explorations, completed; water supply and economic studies continued; and geological explorations in progress.

Hassayampa River: Land classification completed; reservoir and canal surveys and water-supply and economic studies continued; geological explorations and studies of underground water conditions in progress.

Williams River: Land classification completed; reservoir and canal surveys and water-supply and economic studies continued; geological explorations continued.

Arizona-Nevada**Colorado Basin surveys:**

Mojave: Canal surveys and water-supply studies in progress.

Bulls Head Reservoir: Reservoir and dam site topography and foundation explorations completed; water supply and power plant output studies in progress.

Arizona-California

Colorado Basin surveys: Palo Verde and Cibola Valleys: Land classification continued.

California**Colorado Basin surveys:**

Chuckawalla Valley: Land classification continued.

Kings River: Report completed and submitted to Congress.

Sacramento: Studies of water-supply requirements for lands in the Sacramento Valley, other than those to be supplied by the Shasta Reservoir, are in progress; land classification in the American River service area completed; inventory of irrigation possibilities in the American River Valley in progress; report on local irrigation from Sacramento River in progress.

Colorado

Western slope surveys:

Mancos (Mesa Verde National Park water supply): Memorandum report completed.

Florida Mesa: Report completed.

Paonia (North Fork): A supplemental report completed.

La Plata: Report completed.

Silt, Roan Creek, Troublesome, Piceance, Colbran, and Rifle Investigations:

Field surveys completed; water supply and economic studies continued.

Dolores-Montezuma-Dove Creek: Land classification completed; gaging stations established on tributary streams; water supply studies in progress.

Upper Gunnison River: Land classification completed; gaging stations on tributaries established; water-supply studies in progress.

Sau Luis project: Report completed and submitted to Congress.

Grand Mesa: Land classification completed; reconnaissance made of potential reservoir sites.

Yampa River below Yampa, Colo.: Land classification completed; field surveys, water-supply, and economic studies continued.

Blue River-Platte River transmountain diversions: All field surveys and water-supply and economic studies completed; report in preparation.

Eastern slope surveys:

North Republican (Wray): Report completed.

Trinidad (Purgatoire): Preliminary draft of report completed.

Arikaree, South Republican, Smoky Hill, Huerfano, and Apishapa River Investigations: Field surveys completed; water-supply and economic studies continued.

Colorado-Kansas

Arkansas Valley: Field survey and water-supply and economic studies continued.

Colorado-New Mexico

Turley: General reconnaissance completed.

Ship Rock: Field surveys in progress.

Colorado-Wyoming

Little Snake: Reconnaissance made of potential reservoir sites; gaging stations on tributaries established; water-supply and economic studies in progress.

Idaho

Southwestern Idaho Investigations:

Boise project: Detailed geological explorations completed at Twin Springs Reservoir site; surveys completed at Anderson Ranch Reservoir site; report completed on the flood control power and irrigation values of the Twin Springs and Anderson Ranch Reservoir sites. Report on Anderson Ranch Reservoir site submitted to the Congress.

Weiser River: Surveys and geological explorations completed on several reservoir sites; water-supply and economic studies in progress; report on the Mann Creek storage project in preparation.

Mountain Home: Land classification continued.

Salmon River: Land classification and field surveys in progress.

South Fork of the Snake River: Preliminary report completed; flood control studies in progress.

Idaho-Montana

Madison River-Snake River Diversion: Possibility of diverting water from the Madison River to the Snake River has been given consideration in the past. Further work on this study is being carried on in connection with the investigation of the Missouri Valley above Great Falls, Mont.

Kansas

Western Kansas Reconnaissance: Reconnaissance surveys covering reservoir sites; and land classification and canal alignment along the tributaries of the Arkansas, Smoky Hill, and Republican Rivers in progress.

Montana

Missouri Valley above Great Falls: A comprehensive basin-wide study of potential irrigation and power developments in progress. Work is being done in cooperation with the Montana Power Co. and the Montana State Water Conservation Board. The investigation will include completion of studies for the Madison, Gallatin, and Dearborn Valleys, the Canyon Ferry dam site, and the Daley Spur Project.

Marias: Supplemental surveys in progress.

Rock Creek (Valley County): All field work completed, water-supply and economic studies continued.

Fort Peck Pumping: Land classification and canal surveys completed, water-supply studies, transmission-line surveys, and economic studies continued.

Missouri River Basin below Great Falls: General reconnaissance has been made of area in Chouteau County, on Teton River tributaries, and along the Sun River. Water-supply studies have been in progress for the Judith River and Flat Willow areas.

Yellowstone River: Investigations to determine storage possibilities in this basin are in progress.

Hardin Project: Land classification has been completed; canal surveys and water-supply studies in progress.

Bitter Root Valley: Land classification, and water-supply studies in progress.

Missoula Valley: Land-classification surveys in progress.

Deadman's Basin Project: Preliminary report prepared. Construction of project being completed with Reconstruction Finance and W. P. A. funds.

Nebraska

Mirage Flats: Report completed.

Cambridge Project: Field surveys started.

Nebraska-Colorado-Kansas

Republican River Reconnaissance: Field reconnaissance completed; report submitted.

Nebraska-Kansas

Bostwick Project: Field surveys started.

Nevada

Humboldt River: Water-supply studies continued.

Quinn Valley Reconnaissance: Report completed.

New Mexico

Middle Rio Grande: Inventory of present developed works together with economic and water supply studies started.

Pecos River Joint Investigations: Bureau is cooperating with other agencies and the National Resources Planning Board.

North Dakota

Missouri River Tributaries: Field surveys and water-supply and economic studies continued.

Sidney Pumping Extension: Preliminary report prepared.

Bismarck Project: Report completed.

North Dakota-South Dakota

Missouri River Pumping Projects: Field surveys of several potential pumping developments along the Missouri River have been completed. Water-supply and economic studies are being continued.

North Canadian River Investigation (Includes Fort Supply, Optimo, and Canton areas): Field work completed, economic and water supply studies continued.

A preliminary progress report on the Fort Supply area has been submitted.

Mangum Project: Field surveys and land classification in progress.

Cache-Beaver Creek: Reconnaissance surveys completed and report submitted.

Wachita Reconnaissance: Field work completed and water supply studies in progress.

Oklahoma-New Mexico-Texas

South Canadian Reconnaissance: A preliminary field survey has been made of the area and water supply studies are in progress.

Oregon

Grande Ronde Project: Field work and water supply and economic studies continued.

Medford Project: Field work completed, supplemental report submitted.

Canby Project: Supplemental report on progress.

Jackson and Josephine Counties Cooperative Investigation: Field surveys in progress.

Willamette Basin: Preliminary reconnaissance completed.

South Dakota

Rapid Valley Project: Supplemental field work at Pactola Dam site completed.

Angostura Project: Supplemental field work completed, supplemental report submitted.

Buffalo Gap Project (Beaver Creek): Field work and water supply and economic studies continued.

Texas

Balmorea Project: Detailed surveys and water supply and economic studies completed. Preparation of report in progress.

Robert Lee Project: Detailed surveys and water supply and economic studies continued.

Palo Duro Reconnaissance: Surveys and studies in progress.

Brazos River Reconnaissance: Field work started.

Utah

Colorado River Surveys:

Price-Gooseberry, Blue Bench, Ouray, Virgin River, Kanab Creek, Uinta Basin, Vernal-Ashley, and Emery County Projects: Field surveys, water supply and economic studies in progress.

Colorado-Great Basin Project: Land classification, geological surveys, water supply and economic studies in progress.

Salt Lake Basin Cooperative Surveys: Weber River, Woodruff, Big Creek, Otter Creek, Beaver Creek, Bally Watts Projects; Field surveys and water supply and economic studies in progress. Report on Newton project completed.

Utah Power Investigations: Power market studies and surveys of potential power reservoirs on the Colorado River in progress.

Washington

Columbia Basin Project: Land classification and appraisal surveys continued.

Yakima River Basin: Cooperative investigation with Army Engineers relative to flood control started.

Wyoming

Colorado Basin surveys: Green River Projects, including Daniels, Lyman, Pine-dale and Seedskadie: Field work and water supply and economic studies continued.

Eden Project: Field Surveys and water supply studies completed. Report submitted.

Big Horn Basin: Reconnaissances have been made of the Grey Bull, Shell Creek, Wood River, Gooseberry Creek, Nowood River, Owl Creek, and Fifteen Mile Creek areas. Soil surveys have been made of the Buffalo Basin, Schuster Flats, Grass Creek, and Cottonwood Creek areas. Water supply studies are in progress.

Wyoming-Montana

Powder and Tongue Rivers: Reconnaissance surveys, land classification and water supply studies in progress.

Wyoming-Utah-Idaho

Green River-Bear River Diversion: Reservoir and canal surveys and water supply and economic studies continued.

CIVILIAN CONSERVATION CORPS

The 44 C. C. C. camps allocated to the Bureau of Reclamation during the fiscal year 1940 continued their important work in connection with the rehabilitation of Federal Reclamation projects, the development of supplemental water supplies, the construction of new reclamation projects, and the development of recreational facilities at irrigation reservoirs.

A number of important features on several of the projects were completed by the C. C. C. camps during the fiscal year. Enrollees

completed a diversion dam and 10 miles of the Yellowstone feeder canal, both designed to supplement and insure an adequate supply of water for the Moon Lake project in northeastern Utah. Clear Lake Dam on the Klamath project in Oregon was raised 3 feet with C. C. C. forces, providing an additional storage of 84,000 acre-feet. The enrollees constructed a stone masonry parapet and curb wall across the top of the Agency Valley Dam in Oregon. On the Sunnyside Division of the Yakima project in Washington they erected, as a major job of rehabilitating part of the Mabton siphon, 1,550 feet of a continuous wood stave pipe, 56 inches in diameter.

Progress continued to be made in providing facilities for recreational purposes at irrigation reservoirs. The programs at Alcova Reservoir in Wyoming and at Alamogordo Reservoir in New Mexico were brought into a construction stage. A large fish hatchery constructed by C. C. C. forces at Elephant Butte Reservoir in New Mexico was completed and turned over to the Fish and Wildlife Service for operation and maintenance.

Well defined procedures were being developed, with the assistance of C. C. C. crews, for the eradication and control of noxious weeds on reclamation projects, the weed-control problems of the several projects varying under the different climatic conditions encountered. The facilities of the C. C. C. organization lend themselves well to the essential coordination of the laboratory and field work.

Seepage of irrigation water from the canals, with damage to adjacent lands and permanent loss of water for crop purposes, has long been a problem of importance in the operation of reclamation projects. The development of a method of sealing canals that will be economically feasible, has been an objective of the Bureau of Reclamation. C. C. C. forces are engaged on many projects in testing different types of canal linings under actual operating conditions. It is anticipated these experiments will lead to an increased conservation of valuable water otherwise lost to the projects.

The C. C. C. program on reclamation projects is essentially of a construction nature and is closely related to the regular activities of the Bureau. The enrollees are provided an excellent opportunity, not ordinarily afforded to young men of their age, in the building of water-control structures, the concrete lining of canals, and the use of heavy construction equipment. The operation and maintenance of the many trucks, tractors, scrapers, and shovels, which are used by all reclamation camps, give the enrollees specialized training ideally adapted to the highly mechanized industry of the present world.

ORGANIZATION

The Commissioner, appointed by the President and under the supervision of the Secretary, is in administrative charge of the Bureau of Reclamation. He is supported by a staff of 139 officers and employees in Washington. The Chief Engineer at Denver, Colo., assisted by 987 employees, is in general supervision of the engineering and construction activities. Twenty-five construction engineers in charge of projects now under construction, 4 engineers, a director of power at Boulder City, Nev., and 3 supervising engineers, located at Coulee Dam, Wash.; Sacramento, Calif.; and Estes Park, Colo., report to the Chief Engineer. Sixteen superintendents in charge of completed projects report to the Supervisor of Operation and Maintenance at Washington. The 55 field offices, including the Denver office and 5 field legal offices, have a combined personnel of 7,010.

Raymond W. Walter, Chief Engineer, died on June 30, 1940. He was succeeded by Sinclair O. Harper.

Irrigated Acres and Areas in Cultivation and Cumulative Crop Values, by Years, 1906-39

Federal irrigation projects ¹					Warren Act lands			Entire area			
Irrigated acreage	Net area in culti- vation	Total crop value		Irrigated acreage	Net area in culti- vation	Total crop value		Irrigated acreage	Net area in culti- vation	Total crop value	
		For year	Cumulative total			For year	Cumulative total			For year	Cumulative total
1906	22,300	\$244,900	\$5,005,360	22,300	2,20,100	\$244,900	\$5,005,360	22,300	2,20,100	\$244,900	\$5,005,360
1907	187,628	4,760,460	12,641,248	187,628	2,169,000	4,760,460	12,641,248	289,549	2,169,000	4,760,460	12,641,248
1908	289,549	7,635,888	24,561,911	289,549	2,369,500	7,635,888	24,561,911	410,628	2,369,500	7,635,888	24,561,911
1909	410,628	11,920,663	41,493,439	410,628	2,369,500	11,920,663	41,493,439	471,423	2,369,500	11,920,663	41,493,439
1910	471,423	12,944,639	50,592,991	562,311	2,470,100	12,944,639	50,592,991	562,311	2,470,100	13,086,441	66,600,125
1911	562,311	13,086,441	66,600,125	614,477	2,540,000	13,086,441	66,600,125	614,477	2,540,000	16,007,134	82,276,634
1912	614,477	16,007,134	82,276,634	694,422	2,607,000	16,007,134	82,276,634	694,422	2,607,000	15,676,409	98,752,051
1913	694,422	15,676,409	98,752,051	761,271	2,703,424	15,676,409	98,752,051	761,271	2,703,424	16,475,517	116,916,503
1914	761,271	16,475,517	116,916,503	800,649	2,700,035	16,475,517	116,916,503	800,649	2,700,035	18,164,452	149,732,475
1915	800,649	18,164,452	149,732,475	822,821	2,885,291	18,164,452	149,732,475	822,821	2,885,291	20,932,963	160,765,438
1916	1,026,663	966,784	206,916,788	2,102,663	3,081,396	966,784	206,916,788	2,102,663	3,081,396	308,016,183	206,916,788
1917	1,119,566	1,051,193	66,821,396	2,120,668	3,194,862	1,051,193	66,821,396	2,120,668	3,194,862	313,342,600	209,111,180
1918	1,187,255	1,113,469	88,974,137	2,205,420	3,308,685	1,113,469	88,974,137	2,205,420	3,308,685	341,358,789	212,420,369
1919	1,223,480	1,153,820	66,171,650	2,228,750	3,426,585	1,153,820	66,171,650	2,228,750	3,426,585	375,367,189	215,847,954
1920	1,227,500	1,157,900	49,620,300	2,285,420	3,585,715	1,157,900	49,620,300	2,285,420	3,585,715	404,908,930	219,436,269
1921	1,202,130	1,169,100	50,360,850	2,339,670	3,705,585	1,169,100	50,360,850	2,339,670	3,705,585	433,601,690	223,147,859
1922	1,213,700	1,179,870	65,046,300	2,369,670	3,822,475	1,179,870	65,046,300	2,369,670	3,822,475	462,604,160	226,970,334
1923	1,290,890	1,216,610	66,488,560	2,422,750	3,949,225	1,216,610	66,488,560	2,422,750	3,949,225	491,726,030	230,792,809
1924	1,320,300	1,242,750	77,608,880	2,470,040	4,076,035	1,242,750	77,608,880	2,470,040	4,076,035	520,764,030	234,614,339
1925	1,411,020	1,326,810	60,369,620	2,527,105	4,202,785	1,326,810	60,369,620	2,527,105	4,202,785	550,119,660	238,436,819
1926	1,378,990	1,385,560	70,985,450	2,571,130	4,332,865	1,385,560	70,985,450	2,571,130	4,332,865	579,145,460	242,264,299
1927	1,442,080	1,430,070	87,459,670	2,606,856	4,458,380	1,430,070	87,459,670	2,606,856	4,458,380	608,132,120	246,086,779
1928	1,505,810	1,462,565	64,418,940	2,631,330	4,584,095	1,462,565	64,418,940	2,631,330	4,584,095	637,119,660	250,001,239
1929	1,522,718	1,506,320	31,165,752	2,656,905	4,708,998	1,506,320	31,165,752	2,656,905	4,708,998	666,037,429	254,016,759
1930	1,589,770	1,524,903	48,138,576	2,682,787	4,834,142	1,524,903	48,138,576	2,682,787	4,834,142	695,000,909	258,032,279
1931	1,585,144	1,604,166	63,601,663	2,709,016	4,963,311	1,604,166	63,601,663	2,709,016	4,963,311	724,000,909	262,047,809
1932	1,602,132	1,629,174	78,902,818	2,728,387	5,084,764	1,629,174	78,902,818	2,728,387	5,084,764	753,000,909	266,063,329
1933	1,725,453	1,700,969	72,893,649	2,748,609	5,209,115	1,700,969	72,893,649	2,748,609	5,209,115	782,000,909	270,078,849
1934	1,777,584	1,764,363	67,859,804	2,768,832	5,382,374	1,764,363	67,859,804	2,768,832	5,382,374	811,000,909	274,094,369
1935	1,922,868	1,903,259	73,769,654	2,789,055	5,556,728	1,903,259	73,769,654	2,789,055	5,556,728	840,000,909	278,109,889

¹ Includes projects constructed by the United States and those for which supplemental water is furnished from storage works built by United States.² Estimated.

RECLAMATION TABLE 1.—Consolidated Financial Statement, June 30, 1940

DEBIT SIDE

Construction account, primary projects:

Cost of irrigation works:

Original construction.....	\$456,241,095.28
Supplemental construction.....	12,892,718.81
Value of works taken over.....	2,485,731.93

Total construction cost..... 471,619,546.02

Operation and maintenance prior to public notice, net.. \$3,172,455.85

Operation and maintenance deficits and arrearages
funded with construction..... 6,009,098.65

Penalties on water-right charges funded with construc-
tion..... 3,248,498.84

12,430,053.34

Total..... 484,049,599.36

Less income items:

Construction revenues..... \$8,340,233.18

Contributed funds..... 2,101,258.83

Nonreimbursable appropriation, Rio Grande Dam.. 1,000,000.00

11,441,492.01

472,608,107.35

Less abandoned works, nonreimbursable cost and charge-offs..... 17,133,000.70

Balance payable..... \$455,475,106.65

Palo Verde flood protection, cost of construction and repairs..... 48,806.46

Secondary projects and general investigations:

Cost of surveys and investigations..... \$5,652,578.32

Less contributed funds..... 650,338.41

5,002,239.91

General offices expense undistributed..... 194,871.98

Plant and equipment..... 2,189,651.84

Materials and supplies..... 5,347,428.24

Accounts receivable:

Current accounts..... 2,146,589.20

Deferred accounts..... 248,501,787.29

250,648,376.49

Undistributed clearing cost accounts..... 3,114,520.16

Unadjusted debits, disbursement vouchers in transit..... 17,862.50

Cash:

Balance on hand:

Reclamation fund..... 16,353,798.92

General fund..... 52,973,267.65

National Industrial Recovery and P. W. A. allotments..... 4,414,016.42

Emergency Relief allotments..... 354,499.09

Contributed funds..... 143,175.63

74,238,757.71

In special deposit account..... 27,289.32

74,266,047.03

Total debits..... 796,279,186.26

¹ Contra.

RECLAMATION TABLE 1.—Consolidated Financial Statement, June 30, 1940—Con.

CREDIT SIDE

Security for repayment of cost of irrigation works: Contracted construction repayments...	\$302,687,770.10
Current accounts payable.....	9,102,641.07
Deferred and contingent obligations.....	1,209,753.10
Reserves and undistributed profits.....	11,181,002.93
Operation and maintenance results, surplus.....	902,688.38
Unadjusted credits, collection vouchers in transit.....	¹ 19,828.04
Government aid for reclamation of arid lands:	
Reclamation fund.....	\$205,443,013.72
Advances to reclamation fund:	
Treasury loan (act of June 25, 1910).....	\$20,000,000.00
Less amount repaid.....	20,000,000.00
Treasury loan (act of Mar. 4, 1931).....	5,000,000.00
Less amount repaid.....	5,000,000.00
National Industrial Recovery and Public Works Administration allotments.....	75,049,573.68
Emergency Relief allotments.....	46,767,012.28
Work Projects Administration direct expenditures.....	269,840.72
General fund:	
Central Valley project.....	67,000,000.00
Grand Coulee Dam project.....	88,750,000.00
Other appropriations.....	11,896,404.17
	495,175,844.57
Less nonreimbursable appropriations, Rio Grande Dam.....	1,000,000.00
	494,175,844.57
Less impairment of funds:	
Abandoned works.....	2,828,984.62
Nonreimbursable construction cost.....	382,097.31
Operation and maintenance cost uncollectible.....	969,943.39
Washington office cost since December 5, 1924.....	2,839,326.57
Attendance at meetings.....	1,815.90
Giving information to settlers.....	11,238.17
Prepaid civil-service retirement fund.....	2,340.33
Charge-offs (act of May 25, 1926).....	14,699,308.24
Operation and maintenance administration.....	53,521.69
Administrative costs, Denver and field legal offices.....	910,401.36
Returned to Treasury, miscellaneous receipts.....	153.22
Impounded funds, economy acts.....	261,552.05
	22,960,685.85
	471,215,158.72
Total credits.....	796,279,186.26

¹ Contra.

RECLAMATION TABLE 2.—Consolidated Statement by Projects of Construction Cost of Irrigation Works, Other Items Reimbursable With Construction, and Amounts Repayable

State and project	Construction cost		Operation and maintenance before public notice (net)		Operation and maintenance deficits and arrears and penalties		Construction revenues, contributed funds, and nonreimbursable appropriation (contra)		Abandoned works, non-reimbursable cost and authorized charge-offs	Total repayable	
	Fiscal year 1940	To June 30, 1940	Fiscal year 1940	To June 30, 1940	Fiscal year 1940	To June 30, 1940	Fiscal year 1940	To June 30, 1940		Fiscal year 1940	To June 30, 1940
Arizona:											
Gila	\$369,041.39	\$4,561,452.75								\$369,041.39	\$4,561,452.75
Salt River	263,809.23	20,225,003.12								263,809.23	18,669,822.52
Yuma Auxiliary		902,060.50								1,468.39	901,097.00
Arizona-California:											
Yuma		9,373,406.10								114,846.58	9,708,293.48
California:											
Central Valley	24,002,310.29	41,625,645.75	1 \$8,700.00	1 8,700.00						23,898,360.47	41,522,695.93
Orland		2,448,669.71		1 11,432.99		\$1,551.85				1,551.85	2,469,718.89
Colorado:											
Colorado-Big Thompson	2,202,873.88	4,695,268.39								2,274,782.12	4,676,698.21
Fruitgrowers Reservoir	44,895.20	197,193.67								42,305.20	194,693.67
Grand Valley		5,020,641.35								28.62	4,981,724.56
Paonia		16,941.98								16,941.98	16,941.98
Pine River	1,205,129.11	2,468,724.33								1,204,649.11	2,467,724.33
Uncompahgre	180,344.52	8,763,027.14								180,344.52	7,984,778.00
Idaho:											
Boise	30,886.20	16,830,666.45								136,078.23	17,139,691.38
Boise-Payette	648,868.44	3,518,904.84	8.83	1 1,479.72						648,877.27	3,517,425.12
King Hill		1,905,918.80								1,987,854.04	
Mindoka	73,378.52	19,303,723.46	1 175.95	317,845.79						72,802.57	18,218,975.43
Upper Snake River	225,570.02	2,750,368.62								231,538.50	2,755,113.12
Kansas: Garden City		342,963.68									
Montana:											
Bitter Root		947,641.05									
Buffalo Rapids	11,107,369.17									11,107,369.17	1,464,279.00
Chain Lakes	489,484.58	1,719,289.83								485,084.58	1,674,889.83
Fronttown		6,361.72								6,362.38	1,276,017.63
Humtun		1,589,590.46									
Milk River	1,120.30	6,926,011.36								1,099.27	5,663,689.04
Snake River	282,987.25	9,190,481.01								282,977.77	9,289,203.34
Montana-North Dakota: Lower Yellowstone											
Nebraska-Wyoming: North Platte		3,085,433.14	1 765.00	1 7,681.72						1 326.52	4,110,574.50
		19,538,673.94		743,294.42						1 2,790.49	20,963,362.71

New Mexico:	15,526.39	1,186,825.07	19,307.11	19,307.11	44,976.32	52,347.53	13,780.72	1,206,132.15
	28,474.11	7,947,282.86	12,155.44	12,155.44	20,003.00	33,146.50	3,499,936.21	3,499,936.21
		1,065,616.21	4,672.74	4,672.74			1,060,256.95	1,060,256.95
	144,543.85	3,808,702.95	117,751.77	117,751.77	93,395.50	29,108.08	144,543.85	3,490,355.02
	479,370.78	339,491.68	32,952.01	32,952.01	656.03	371,787.66	479,370.78	576,088.61
		2,159,601.86						
	60,601.74	15,524,180.16	15,771.13	15,771.13	364,531.65	186,774.64	60,601.74	2,147,188.13
	112,498.40	1,295,266.88					174,276.24	14,150,516.74
	978,671.29						978,671.29	1,295,266.88
New Mexico:		223,423.06	131.75	131.75				
		517,630.09	165.00	165.00				
		73,313.08						
New Mexico:		281,591.64						
		603,489.26						
		790,358.20						
		97,830.24						
		5,138,949.61						
		4,812,840.30						
New Mexico:		18,572.27	1229.90	1229.90				
		188,310.41						
New Mexico:		100,997.07						
New Mexico:		923,343.86						
		1,560,523.64						
		4,040,652.83						
		3,834,732.78						
		2,726,883.40						
		374,045.00						
		3,507,423.49						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						
New Mexico:		118,458,237.66						
		1,452,129.45						
		26,254,774.75						
		7,564,361.79						

1 Contra.

2 Transferred to water conservation and utility projects

WATER CONSERVATION AND UTILITY PROJECTS

State and project	Construction cost		Operation and maintenance during construction		Construction revenues, contributed funds, and nonreimbursable appropriation (contra)		Construction revenues (contra)		Abandoned works, non-reimbursable cost and authorized charge-off	Net	
	Fiscal year 1940	To June 30, 1940	Fiscal year 1940	To June 30, 1940	Fiscal year 1940	To June 30, 1940	Fiscal year 1940	To June 30, 1940		Fiscal year 1940	To June 30, 1940
Montana:											
Buffalo Rapids, First Division	\$1,509,826.73	\$1,509,826.73	\$583.33	\$583.33			\$215.00	\$215.00		\$1,510,195.06	\$1,510,195.06
Buffalo Rapids, Second Division	26,281.38	26,281.38								26,281.38	26,281.38
Nebraska: Mirage Flats	4,877.98	4,877.98								4,877.98	4,877.98
North Dakota: Buford-Trenton	86,305.87	86,305.87								86,305.87	86,305.87
South Dakota: Rapid Valley	21,880.15	21,880.15								21,880.15	21,880.15
Total	1,649,172.11	1,649,172.11	583.33	583.33			215.00	215.00		1,649,540.44	1,649,540.44

³ Major portion of expenditures made from emergency relief funds.

BOULDER CANYON PROJECT
Boulder Dam, Power Plant, and Appurtenant Works
RECLAMATION TABLE 3.—Financial Statement June 30, 1940
ASSETS AND OTHER DEBITS

I. INVESTMENTS

Fixed capital under construction.....	\$120, 178, 943. 19
Other physical properties.....	1, 478, 419. 10
Investigations—Colorado River Basin.....	232, 205. 65
Investigations—Parker-Gila project.....	75, 350. 64
Other capital expenditures—Interest during construction.....	20, 409, 749. 43
Earnings and expenses during construction.....	¹ 571, 794. 20
Total investments (schedule 2).....	\$141, 802, 873. 81

II. CURRENT AND ACCRUED ASSETS

Treasury cash:	
For advance to Colorado River Dam fund.....	\$4, 450, 000. 00
Colorado River Dam fund.....	1, 099, 272. 94
N. I. R. A.—Parker-Gila project.....	6, 096. 00
Collections in transit.....	414, 968. 37
Total Treasury cash (schedule 1).....	5, 970, 337. 31
Disbursing officer's cash (schedule 1).....	416, 744. 51
Accounts receivable.....	81, 147. 74
Total current and accrued assets.....	6, 468, 229. 56

IV. DEFERRED AND UNADJUSTED DEBITS

Clearing and apportionment accounts.....	¹ \$182, 538. 53
Field cost adjustments.....	860. 11
Jobbing accounts.....	27, 107. 38
Prepayments.....	—
Unadjusted debits.....	¹ 10, 592. 74
Total deferred and unadjusted debits.....	¹ 165, 163. 78
Total assets and other debits.....	148, 105, 939. 59

LIABILITIES AND OTHER CREDITS**X. CAPITAL AND LONG-TERM LIABILITY**

Long-term liability—U. S. Treasury authorized appropriation.....	\$126, 500, 000. 00
Less: Authorized but not appropriated.....	190, 000. 00
Total long-term liability:	
Appropriated but not advanced.....	4, 450, 000. 00
Appropriated and advanced.....	121, 860, 000. 00
Less: Impounds, Legislative Economy Act.....	¹ 137, 653. 66
N. I. R. A. allotment Parker-Gila project.....	93, 000. 00
Interest on advances to Colorado River Dam fund.....	20, 384, 117. 85
Judgments—Court of Claims.....	37, 766. 29
Total.....	146, 687, 230. 48

XI. CURRENT AND ACCRUED LIABILITIES

Audited accounts payable:	
Contractors,—current.....	7, 592. 85
Contractors earnings—hold-back.....	1, 689. 50
Labor.....	58, 997. 26
Purchases.....	6, 905. 04
Freight and express.....	49, 977. 79
Passenger fares.....	708. 16
Rights-of-way.....	—
Miscellaneous.....	11, 894. 84
Refunds.....	—
Total audited accounts payable.....	137, 765. 44
Accrued interest.....	—
Total current and accrued liabilities.....	137, 765. 44

¹ Contra.

XIII. DEFERRED AND UNADJUSTED CREDITS

Unadjusted credits..... 4, 472. 07

XV. RESERVES

Reserve for amortization of long-term debt and payment to States..... 1, 276, 471. 6

Total liabilities and other credits..... 148, 105, 939. 5

BOULDER CANYON PROJECT

Boulder Dam, Power Plant, and Appurtenant Works

RECLAMATION TABLE 4.—Appropriations and Cash Statement June 30, 1940

	Regular appro- priation	N. I. R. A. al- lotment	Total	N. I. R. A. Parker-Gila project
TREASURY CASH				
Appropriations and allotments.....	\$88, 310, 000. 00	\$38, 000, 000. 00	\$126, 310, 000. 00	\$93, 000. 00
Advances to Colorado River Dam fund.....	83, 860, 000. 00	38, 000, 000. 00	121, 860, 000. 00	
Balance not advanced.....	4, 450, 000. 00		4, 450, 000. 00	
Colorado River Dam fund:				
Advanced from appropriation to fund.....	83, 860, 000. 00	38, 000, 000. 00	121, 860, 000. 00	
Collections deposited in fund.....	13, 020, 732. 72	23, 403. 44	13, 044, 136. 16	5, 182. 67
Total advances and collections.....	96, 880, 732. 72	38, 023, 403. 44	134, 904, 136. 16	98, 182. 67
Transfer to miscellaneous receipts, Treas- ury.....	10, 200, 000. 00		10, 200, 000. 00	
Disbursements by General Accounting Office.....	4, 985, 631. 93	54, 723. 63	5, 040, 355. 56	
Advance to disbursing officers.....	80, 596, 427. 98	37, 968, 079. 68	118, 564, 507. 66	92, 086. 67
Total withdrawals.....	95, 782, 059. 91	38, 022, 803. 31	133, 804, 863. 22	92, 086. 67
Balance.....	1, 098, 672. 81	600. 13	1, 099, 272. 94	6, 096. 00
Repay collections in transit.....	480. 24		480. 24	501. 00
Miscellaneous collections in transit.....	413, 987. 13		413, 987. 13	
Total Treasury cash (G. L. 121).....	1, 513, 140. 18	600. 13	1, 513, 740. 31	6, 597. 00
DISBURSING OFFICERS' CASH				
Advances and appropriation transfer ad- justments.....	80, 606, 661. 87	37, 974, 709. 56	118, 581, 371. 43	92, 086. 67
Disbursements by disbursing officers.....	80, 205, 625. 98	37, 974, 481. 10	118, 180, 107. 18	87, 872. 29
Disbursing officers checking balance.....	401, 035. 89	223. 46	401, 264. 35	4, 214. 38
Collections by disbursing officers.....	13, 448, 747. 64	29, 416. 43	13, 478, 179. 84	5, 683. 57
Collections deposited and appropriation transfer.....	13, 437, 481. 86	29, 416. 43	13, 466, 914. 06	5, 683. 57
Collections not deposited.....	11, 265. 78		11, 265. 78	
Total disbursing officers' cash (G. L. 122).....	412, 301. 67	228. 46	412, 530. 13	4, 214. 38

ALL-AMERICAN CANAL

RECLAMATION TABLE 5.—Financial Statement June 30, 1940

ASSETS AND OTHER DEBITS

I. INVESTMENTS

Fixed capital under construction..... \$28, 707, 177. 42

II. CURRENT AND ACCRUED ASSETS

Treasury cash:		
For advances to Colorado River Dam fund.....	\$2, 475, 000. 00	
Colorado River Dam fund.....	157, 794. 35	
P. W. A., N. I. R. A., and E. R. A. allotments.....	21, 089. 89	
Contributions—Imperial Irrigation District.....	22, 797. 59	
Collections in transit.....	2, 173. 50	
Total Treasury cash.....	2, 678, 855. 33	
Disbursing officer's cash.....	739, 011. 02	
Accounts receivable.....	58, 768. 92	
Total current and accrued assets.....		3, 476, 635. 27

IV. DEFERRED AND UNADJUSTED DEBITS

Clearing and apportionment accounts.....	¹ \$12, 409. 99	
Field cost adjustment.....	14, 134. 07	
Unadjusted debits.....	2, 456. 11	
Total deferred and unadjusted debits.....		4, 180. 19
Total assets and other debits.....		32, 187, 992. 88

¹ Contra.

LIABILITIES AND OTHER CREDITS

X. CAPITAL AND LONG-TERM LIABILITY

Long-term liability—U. S. Treasury authorized appropriation.....	\$38, 500, 000. 00	
Less: Authorized but not appropriated.....	6, 600, 000. 00	
Total long-term liability:		
Appropriated but not advanced.....	2, 475, 000. 00	
Appropriated and advanced.....	29, 425, 000. 00	
		31, 900, 000. 00

XI. CURRENT AND ACCRUED LIABILITIES

Audited accounts payable:		
Contractors' earnings—current.....	\$93, 921. 94	
Contractors' earnings—hold-back.....	74, 429. 53	
Labor.....	13, 540. 85	
Purchases.....	11, 136. 86	
Freight and express.....	10, 762. 43	
Passenger fares.....	121. 21	
Rights-of-way.....		
Miscellaneous.....	475. 71	
Refunds.....	25. 00	
Total current and accrued liabilities.....		204, 413. 53

XII. OTHER CREDITS

Contributed funds—Imperial and Coachella Irrigation Districts.....	80, 000. 00
--	-------------

XIII. DEFERRED AND UNADJUSTED CREDITS

Unadjusted credits.....	\$1, 411. 80	
Unadjusted credits, Yuma project.....	97. 12	
Total deferred unadjusted credits.....		1, 508. 92

XV. APPROPRIATED SURPLUS

Appropriated surplus not specifically invested.....	2, 070. 43	
Total liabilities and other credits.....		32, 187, 992. 88

ALL-AMERICAN CANAL
RECLAMATION TABLE 6.—Appropriation and Cash Statement June 30, 1940

	N. I. R. A. allotment	P. W. A. allot- ment	Emergency re- lief allotment	1938 P. W. A. allotments	Regular appro- priation	Contributed funds
TREASURY CASH						
Appropriations						
Advances to Colorado River Dam fund.					\$12,000,000.00	
Balance not advanced.					9,525,000.00	
					2,475,000.00	
Colorado River Dam fund:						
Advances to Colorado River Dam fund, allotments and contributed funds	\$6,000,000.00	\$2,900,000.00	\$10,000,000.00	\$1,000,000.00	9,525,000.00	\$80,000.00
• Collections deposited.	18,898.96	3,090.60	23,335.50		359,421.08	
Total advances, allotments, etc.	6,018,898.96	2,903,090.60	10,023,335.50	1,000,000.00	9,884,421.08	80,000.00
Disbursements by General Accounting Office.	61,164.24	16.17	551.97		4,626.73	
Advances to disbursing officers and disbursements.	5,953,703.36	2,902,997.18	10,020,000.00	983,802.25	9,722,000.00	57,202.41
Total withdrawals.	6,014,867.60	2,903,013.35	10,020,551.97	983,802.25	9,726,626.73	57,202.41
Balance.						
Repay collections in transit.	4,031.36	77.25	2,783.53	14,197.75	157,794.35	22,797.59
Miscellaneous collections in transit.					2,097.41	
					76.09	
Total Treasury cash.	4,031.36	77.25	2,783.53	14,197.75	2,634,967.85	22,797.59
DISBURSING OFFICERS' CASH						
Advances and appropriation transfer adjustments.	5,953,878.34	2,902,997.18	10,020,000.00		9,722,000.00	
Disbursements by disbursing officers.	5,890,363.06	2,887,492.61	9,906,169.35		9,175,839.48	
Disbursing officers' check balance.	63,515.28	15,504.57	113,830.65		546,160.52	
Collections by disbursing officers.	19,003.19	3,090.60	23,335.50		361,594.58	
Collections deposited and appropriation transfer.	19,003.19	3,090.60	23,335.50		361,594.58	
Collections not deposited.						
Disbursing officers' cash balance.	63,515.28	15,504.57	113,830.65		546,160.52	

BONNEVILLE POWER ADMINISTRATION

Paul J. Raver, *Administrator*

THE force of the Federal Government's long-range program for the development of the multiple uses of the Columbia River is already being felt in the Pacific Northwest.

Events of the last year indicate that the construction of such multipurpose projects as Bonneville dam, 40 miles east of Portland, Oreg., and Grand Coulee dam, farther up the Columbia River in Central Washington, is providing the foundation for a new and more abundant economy in the region.

Not only do these projects provide for irrigation and flood control and for new avenues of inland transportation, but also create a great and wholly new source of electric power essential to the full development of the territory.

Because power is not the sole product of the large dams, but merely one of many products of large scale projects such as Bonneville, it is possible to market the energy at the lowest wholesale rate in America—\$17.50 a kilowatt year at any point on the Government's transmission system. These low rates have already been reflected in a general lowering of retail rates charged consumers of systems using Federally generated Columbia River power, in a general rise in domestic and commercial electric usage, and in the establishment of wholly new industries in the area.

NEW POWER PLAYS DEFENSE ROLE

In addition to these increasing benefits to the region, where in the past the economy has been based upon the lumber industry and upon agriculture, it is now recognized that these large projects will and already are playing a vital role in providing for the defense of the Nation. Nowhere in the United States today is there so great a source of dependable electric power. Power is essential to many of the industries now engaged in the manufacture of defense materials, and as expansion of these industries takes place to meet the growing defense demands of the Federal Government, such industries are turning to the Pacific Northwest.

As a result of this emergency demand, as well as a rapidly expanding normal market, which studies indicate will require the total output

of both dams by 1950, it has become apparent in recent months that generating equipment should be installed as rapidly as possible at both Bonneville and Grand Coulee. Already the Bonneville Power Administration is contracting ahead of generator installation, and anticipates in the near future calling upon Grand Coulee for a large block of power to meet industrial needs.

Two 43,200-kilowatt generators have been installed and are in operation at Bonneville Dam. Two additional 54,000-kilowatt generators are being installed and are scheduled for service in January 1941. Two others of the same size are scheduled for installation by January 1942 and recommendations have gone forward for the installation of the four remaining 54,000-kilowatt generators which will bring the Bonneville plant to its full capacity of 518,400 kilowatts.

Installation of the first of eighteen 108,000-kilowatt generators in the Grand Coulee power house is scheduled for July 1941 with No. 2 scheduled for September 1941 and No. 3 for January 1942.

MANY NEW INDUSTRIES POSSIBLE

In a period when the country is faced with the problem of rearming, establishment of new industries in virgin territory close to new supplies of power becomes significant. These industries are directly and indirectly related to war requirements. Among industries which have entered preliminary discussion with the Bonneville Power Administration are those which will produce aluminum, ferro chrome, magnesium, chlorates and hydrates, and alloy steel. All of these products are used in the defense industries of aircraft, munitions, ordnance, and shipbuilding. All fall in the fields of electro-chemistry and electro-metallurgy, fields that ordinarily would be expected to develop in the Pacific Northwest because of the importance to them of cheap power and the availability of materials.

In appraising the possible contributions of the Northwest to the national defense program as the result of the construction of Bonneville and Grand Coulee Dams, an important fact should be noted about the present location of the war industries of the Nation. Most of them lie in the Northeastern States, east of the Mississippi River, occupying 13 percent of the land area of the country. In contrast, the 11 Western States, covering 40 percent of the land area, are not equipped with industries to provide adequately for the defense of the Pacific Coast and Pacific possessions, nor with industries to supplement, when necessary, the production of eastern plants for the defense of the Atlantic outposts.

These Western States lack munitions and ordnance plants. They have only some shipbuilding and aircraft manufacturing facilities; but even for these industries the west draws upon the east for many basic materials and parts that could be made closer to the western plants.

These circumstances do not contribute to the speedy and most effective defense of the United States and its possessions. The products of western mines, vital to the war industries in the East—copper, lead, zinc, mercury, tungsten, molybdenum, etc.—have to move east 2,000 miles for processing and fabrication. Most of this has to return 3,000 to 6,000 miles in the form of materials and supplies for the defense outposts of the Pacific Coast, Alaska, and Hawaii. Some of these movements could be eliminated. Thus, copper, and zinc could be made into brass for munitions close to the western mines. Pig aluminum, now being made at the new plant of the Aluminum Co. of America in the State of Washington, could be converted into sheets and extruded parts in western mills to supply the large aircraft plants of the Pacific Northwest.

All this is made possible by the enormous reservoirs of low cost power created by the Federal Government on the Columbia River that await the command of the Nation to serve whatever uses may be dictated by the interests of national defense.

MARKETING PROCEEDS RAPIDLY

The marketing of Columbia River power has proceeded at a rapid rate and present prospects are that there will be an even greater acceleration of sales during the next year. On June 30, 1940, the Bonneville Power Administration, which has since been authorized by the President to market Grand Coulee as well as Bonneville power, had executed firm contracts totaling 101,350 kilowatts, with deliveries scheduled on the basis of generator installation and line completion. By September 1940 contracts for an additional 5,500 kilowatts had been executed and additional contracts submitted totaling 10,800 kilowatts. Recent deliveries, including sales of dump energy and interchange of energy, have ranged up as high as 91,000 kilowatts, or more than the rated capacity of the two generating units now in operation at the Bonneville powerhouse. On the basis of contracts negotiated and other prospective sales, revenues of the Bonneville Power Administration will total about \$1,880,000 for the fiscal year 1941 and \$4,000,000 for the fiscal year 1942.

Prime power contracts executed as of September 14, 1940

Date		Name	Kilowatts	Energized
Contract	Commitment			
Aug. 2, 1939	Jan. 3, 1940	Public utility districts:		
Oct. 5, 1939	Oct. 1, 1940	Skamania County.....	200	Jan. 3, 1940
Nov. 10, 1939	Oct. 1, 1940	Pacific County.....	1,500	
Dec. 5, 1939	Oct. 1, 1940	Wahkiakum County.....	400	
May 15, 1940	Dec. 1, 1941	Klickitat County.....	1,500	
		Tillamook County.....	2,000	
			5,600	
		Municipalities:		
Feb. 14, 1939 ¹	July 25, 1938	Cascade Locks.....	200	July 25, 1938
Nov. 7, 1939	Nov. 28, 1939	Forest Grove.....	750	Nov. 28, 1939
Dec. 22, 1939	Feb. 1, 1940	Canby.....	300	Feb. 1, 1940
Jan. 4, 1940	Oct. 1, 1940	Monmouth.....	400	
Jan. 13, 1940	Oct. 1, 1940	McMinnville ²	1,000	
Feb. 13, 1940	Oct. 1, 1940	Centralia ³	300	
Feb. 23, 1940	Jan. 1, 1941	Tacoma.....	(⁴)	
May 6, 1940		Seattle.....	(⁴)	
Aug. 1, 1940	Apr. 1, 1941	Ellensburg.....	2,000	
Aug. 20, 1940	Oct. 1, 1940	Eugene ³	1,500	
			6,450	
June 27, 1940	Sept. 15, 1940	R. E. A. cooperatives: Oregon-Lincoln ⁴	300	
		Private utilities:		
Dec. 1, 1939	Dec. 1, 1939	Portland General Electric Co.....	20,000	Dec. 1, 1939
June 4, 1940	Mar. 15, 1941	Pacific Power & Light Co., Astoria ²	1,500	
July 27, 1940	Aug. 4, 1940	Northwestern Electric Co. and Wash- ton Water Power Co.....	(⁴)	Aug. 4, 1940
			21,500	
		Industries:		
Dec. 23, 1939	Sept. 1, 1940	Aluminum Co. of America.....	32,500	Aug. 31, 1940
Feb. 20, 1940		Sierra Iron Co.....	6,000	
Apr. 16, 1940	Jan. 1, 1941	Aluminum Co. of America.....	32,500	
July 13, 1940	Jan. 1, 1941	Pacific Carbide & Alloys Co.....	2,000	
			73,000	
		Total.....	106,850	
		Transfer agreements:		
Jan. 11, 1940	Nov. 28, 1939	Portland General Electric Co., Forest Grove.....		
Jan. 11, 1940	Feb. 1, 1940	Portland General Electric Co., Canby.....		
July 16, 1940	Sept. 30, 1940	Northwestern Electric Co.-Pacific Car- bide & Alloys Co.....		

¹ Supply effective Nov. 1, 1939.² Contract also provides for interchange of power.³ Contract calls for additional sales of dump power and provides for interchange of power.⁴ Interchange.

In addition contract negotiations are being carried on with applicants of all types—public and private agencies, cooperatives, and industries—which have formally requested more than a half million kilowatts. Congress has provided in the Bonneville Act that 50 per cent of installed capacity of Bonneville dam be reserved until 1942 for public bodies and cooperatives and that preference be given those groups thereafter. But many of these applicants are not in a position to take power immediately. This is especially true of public utility districts which must acquire distribution systems before going into the power business. These districts are currently negotiating with private utility companies to purchase the necessary facilities. When this last obstacle has been overcome, the large public market for Columbia River power which Congress visioned will come into existence.

GRID CONSTRUCTION SPEEDED

In order to meet the expanding market for Columbia River power, and in order to carry out the mandate of Congress that Government power shall be carried to the markets of the Pacific Northwest over Government lines at the low uniform wholesale rate, it has been necessary to carry on a high-speed transmission construction program. This program involves construction of a high-voltage grid system linking Grand Coulee and Bonneville Dams with the principal hydroelectric plants of the territory. The magnitude of the program required to keep construction abreast with sales has resulted in simultaneous construction of lines on many fronts.

Because of this rapid development of the construction program it was necessary to increase the Bonneville Power Administration personnel during the year. On June 30, 1940, 2,421 persons were employed. Of these, 1,203 were engaged as hourly laborers and skilled craftsmen in construction work, such as clearing right-of-ways, location and construction of power lines, substations, and related equipment. All employees were secured in accordance with Civil Service rules and regulations and in accordance with section 10 of the Bonneville Act, with special emphasis being placed on selection of employees from the Pacific Northwest. An analysis of the staff shows 92.6 percent residents of Oregon and Washington.

SIX HUNDRED MILES OF LINE COMPLETE

To date a total of 600 circuit miles of transmission line has been completed, 449 miles is under construction, and 189 miles, scheduled for completion early in 1941, is ready for contract.

The Bonneville Power Administration's first high tension transmission lines, two 40-mile 230,000-volt circuits between the Bonneville dam and Vancouver, Wash., were completed December 1, 1939. A few hours later power was being delivered to the Portland metropolitan area. On August 6, 1940, a 235-mile circuit built to connect the generators of Bonneville and Grand Coulee dams, was completed and energized, setting a new record for high-speed line construction on the project. Surveys for this line began August 25, 1938, with actual construction starting a year later.

Meanwhile, construction of other segments of the main transmission system was proceeding at high speed, and by September 1, 1940, the following circuits had been installed:

Vancouver, Wash., to Kelso, Wash., 41.2 miles; Kelso, Wash., to Chehalis, Wash., 30.5 miles; Chehalis, Wash., to Raymond, Wash., 45.5 miles; Condit, Wash., to Glenwood, Wash., 22.5 miles; Vancouver, Wash., to Eugene, Oreg., 127.7 miles; Salem, Oreg., to Mc-

Minnville, Oreg., 21.7 miles; Vancouver, Wash., to Aluminum Co. of America plant, 4.2 miles.

Lines under construction on September 1, 1940, included: Covington, Wash., to Tacoma, Wash., 13 miles; Salem, Oreg., to Monmouth, Oreg., 13 miles; Vernita, Wash., to Hanford, Wash., 19 miles; Hanford, Wash., to Pasco, Wash., 35 miles; Pasco, Wash., to Walla Walla, Wash., 32 miles; Walla Walla, Wash., to Pendleton, Oreg., 44 miles; Walla Walla, Wash., to Lewiston, Idaho, 85 miles; Lewiston, Idaho, to Colfax, Wash., 42 miles; Vernita, Wash., to Ellensburg, Wash., via Yakima, Wash., 69 miles; Bonneville Dam to Oregon City, Oreg., 51 miles; Oregon City, Oreg., to Salem, Oreg., 36 miles.

Bids also had been invited for construction of the following: Portland, Oreg., to Astoria, Oreg., 82.2 miles; Bonneville Dam to Hood River, Oreg., 22 miles; Hood River, Oreg., to The Dalles, Oreg., 16.1 miles; Chehalis, Wash., to Covington, Wash., on the outskirts of Seattle, Wash., 69.4 miles.

Other lines are contemplated in the near future from Grand Coulee Dam to Covington, Wash., completing the main transmission loop linking the two Federal power plants with major generating plants of the Puget Sound area of northwestern Washington; from Grand Coulee Dam to Spokane, Wash., and Colfax, Wash., completing the eastern Washington loop of the Federal transmission system; and from Pendleton, Oreg., to La Grande, Oreg.

SUBSTATION PROGRAM EXTENSIVE

In order to transform the power from the high voltages required to carry it over the transmission network to voltages suitable for delivery to distributing agencies it has been necessary to provide a number of substations of various types. The largest of these is located at Vancouver, Wash. Others are being built or are scheduled for construction at Covington, Wash., St. Johns, Oreg., Vernita, Wash., Salem, Oreg., Eugene, Oreg., McMinnville, Oreg., Raymond, Wash., Chehalis, Wash., North Bonneville, Wash., Hanford, Wash., Ellensburg, Wash., Astoria, Oreg., Walla Walla, Wash., Pendleton, Oreg., The Dalles, Oreg., Colfax, Wash., and Lewiston, Idaho.

Construction of the Federal transmission system into all sections of the Pacific Northwest is guaranteeing that Columbia River power will be available to all types of distributors and industries at the same low wholesale rate. Interconnection of the Federal system with other generating plants, both public and private, in addition assures the Pacific Northwest one of the most dependable supplies of power in the United States today, and the only remaining available source of hydro power in blocks of sufficient size to supply the expansion needs of major

industries. The magnitude of this power supply may be measured by the fact that Bonneville and Grand Coulee together will produce more than 2,400,000 kilowatts when all the generators are installed at both dams. This is over a million kilowatts more than will be available from all 10 dams of the Tennessee Valley Authority.

This, plus the abundant transportation facilities—deep water, barge and rail—and a wealth of mineral resources is encouraging the establishment of new industries in the area. The Aluminum Co. of America has contracted for 65,000 kilowatts of Bonneville power and has established its first western reduction operation at Vancouver, Wash. Two other new industries—calcium carbide and alloys, and iron—have also situated in the area to take advantage of Columbia River power and regional resources. Other industries, pressed for large blocks of power, are also negotiating with the Bonneville Power Administration.

GENERAL LAND OFFICE

Fred W. Johnson, *Commissioner*

FACILITATION of national defense and continuation of the program for conservation of the resources of the public domain were the primary objectives of the General Land Office during the year. Withdrawals of the public lands and requests for withdrawals in connection with the national-defense program embraced more than 7,000,000 acres. In addition, all outstanding aviation leases and beacon light permits contain provisions under which the Secretary of War may assume full control over the lands whenever the President deems them necessary for military purposes. A total of 41,369 acres have been withdrawn for air-navigation purposes.

The food supply of the Nation is vital to national defense, and a prime factor in the food supply is potash fertilizer. As a result of the war, shipments of this material from Europe and elsewhere have practically ceased. To meet the emergency, over 6,000 acres of land, comprising the greater part of the dry bed of ancient Searles Lake in California, have been leased. This area is rich in potash and the supply which will be available from this source, together with other potash produced in this country, largely from land leased from the Government in California and New Mexico, should be sufficient to meet all domestic needs.

For many sections of the United States, the township plats which depict the public land surveys, including general topography, supply the only map data available for military purposes. The rectangular system of surveys supplies a simple, concise, and definite identification of the boundaries of lands. During the year cadastral engineering activities resulted in surveys embracing 5,693,105 acres, in addition to engineering investigations and special projects. The surveys, figured on a mileage basis, cover a total of 35,549 miles.

Total cash receipts of the General Land Office from all sources amounted to \$7,057,942.16. This was more than three times the amount of the expenditures for operations and made the fourth consecutive year in which the receipts were in excess of \$7,000,000. The average receipts for the years 1933 to 1936, inclusive, amounted to \$4,472,358.48.

Conservation of the grazing resources on the vacant and unreserved public lands was furthered by regulated grazing under section 15 of



SETTING THE MONUMENT.

Final step in land-measurement operations by General Land Office surveyors in mapping the public domain, many portions of which now serve as areas for defense training as well as potential sources of strategic mineral supplies.

the Taylor Grazing Act. At the close of the year, grazing leases were outstanding on 7,411,986.77 acres, as against 5,830,743 acres outstanding at the close of the preceding year. Revenues from grazing leases during the fiscal year aggregated \$152,378.34, compared with \$137,365.13 during the preceding year.

The change from the system of issuing permits to prospect for oil and gas on the public domain, as authorized under the act of February 25, 1920 (41 Stat. 437), to the system of issuing leases under the amendatory act of August 21, 1935 (49 Stat. 674), has been practically completed. The change was designed to aid in the conservation of the oil and gas resources, prevent speculation, and secure more adequate returns to the United States from such resources. All outstanding oil and gas prospecting permits (except 126 in Alaska) terminated on December 31, 1939. With the exception of the Alaska permits, the right to prospect for oil and gas will be governed exclusively by the provisions of the amendatory act of August 21, 1935. This act granted to the holders of permits the right to exchange the permits for leases. Approximately 70 percent of these permits have been exchanged or are in process of being exchanged for leases.

Five oil and gas leases, embracing 1,370 acres in producing structures, were sold at public auction, in accordance with the policy of the Department to lease Government oil and gas lands which are subject to drainage as a result of drilling operations on nearby privately owned lands.

Management of the timber resources on the approximately 2,500,000 acres of revested Oregon and California railroad and reconveyed Coos Bay Wagon Road grant lands, in Oregon, was furthered through additional research, inventory, and classification and establishment of improved procedures for maintaining sustained yield cutting. Classification of the timberlands has progressed satisfactorily and preliminary estimates of present timber volume have been prepared for the entire forested area. The timber-producing capacity of the lands is being determined and intensive studies are under way in preparation for definite subdivision of the revested lands into master sustained-yield units.

The Branch of Planning, Use, and Protection made substantial progress on an inventory of the resources of the public domain, the mapping of the public domain lands, the classification of lands for which application for entry, selection, or location had been made, and the assembly and analysis of information concerning the economic resources of Alaska.

By direction of Congress the General Land Office compiled and prepared a new edition of the official wall map of the United States.

In order to secure increased benefits to the people from the use of the public lands, regulations were issued on August 7, 1939 (Circular No. 1459), providing for an annual rental charge of \$5 per mile or fraction thereof for rights-of-way over the public lands for telegraph and telephone lines, tramroads, oil and gas pipe lines, water pipe lines, ditches and canals, and a charge of \$5 per acre or fraction thereof, per annum, for the use of public lands for reservoirs, water plants, well sites, and other like structures, when such rights-of-way or uses are permitted or authorized by the acts of January 21, 1895 (28 Stat. 635), February 15, 1901 (31 Stat. 790), March 4, 1911 (36 Stat. 1253), and section 28 of the act of February 25, 1920, as amended by the act of August 21, 1935 (45 Stat. 1057).

Regulations were issued governing the utilization, primarily through lease, of small areas of the public domain outside certain national reservations for home-site, cabin, camp, health, convalescent, recreational, or business-site purposes, under the provisions of the five-acre tract act of June 1, 1938 (52 Stat. 609). The regulations authorize the filing of applications for such sites commencing August 9, 1940.

All applications received will be considered in the light of their effect upon the conservation of national resources and with respect to the effect they may have, if allowed, upon the welfare, not only of the applicants themselves but of the communities in which the lands applied for are situated.

Applications will not be allowed, for example, which would lead to private ownership or control of scenic attractions or water resources that should be kept open to public use. Settlement will not be permitted which would contribute toward making public charges of the settlers. Nor will isolated or scattered settlements be permitted which would impose heavy burdens upon the State or local governments for roads or schools, or for police, health, and fire protection or which would create eyesores along public highways.

During recent years there has been a marked change in the character of the work performed in the General Land Office. The former system of land disposals which required the issuance of patents has been superseded to a large extent by the present systems of leasing. Moreover, the areas remaining subject to the operation of the public-land laws have been greatly reduced. In these circumstances, it was found that the continuance of the office of recorder was not necessary and by authority of the Reorganization Act of April 3, 1939 (53 Stat. 561), and under the Third Reorganization Plan of the President which became effective June 30, 1940, the position of Recorder of the General Land Office was abolished. Acting under authority of that act and plan, the Secretary of the Interior on July 6, 1940, designated the Chief and Assistant Chief of the Patents Division of the General Land Office

to perform the duties formerly delegated to the recorder. These duties include the countersigning of land patents.

In order to meet a public demand for accurate information concerning the present and past activities of the General Land Office, a series of information bulletins has been prepared. These bulletins, copies of which are available free of charge, contain information on the following subjects:

- No. 1. Land grants to States and Territories for educational and other purposes.
- No. 2. Information relative to the disposal and leasing of public lands in Alaska.
- No. 3. Information relative to homestead laws and regulations.
- No. 4. Areas of the vacant public lands by States, counties, land districts, and grazing districts.
- No. 5. Information concerning land grants for roads, canals, river improvements, and railroads.

The regulations relating to the public lands, which were codified and printed as a part of volume 11, title 43, of the Code of Federal Regulations, have been reprinted as a separate volume, with an index and tables, and with a supplement which in effect brings the volume up to April 17, 1940. Copies are for sale by the Superintendent of Documents, Government Printing Office, at \$2 for title 43 and \$0.10 for the supplement.

In response to a continuing demand from county surveyors, landowners, and others, the pamphlet "Restoration of Lost or Obliterated Corners and Subdivision of Sections," has been revised and is for sale by the Superintendent of Documents at \$0.10 per copy.

There were decided on principles of equity and referred to the Board of Equitable Adjudication and confirmed 1,283 homestead entries of the public lands, 33 homestead entries of revested and reconveyed lands in Oregon, 8 homestead entries of ceded Indian lands, 18 reclamation homesteads, and 51 desert-land entries.

Sixteen civil suits were recommended to cancel leases for oil and gas, and coal, to cancel a patent obtained through fraud, to recover royalties due under coal permits, and to quiet title in the United States to oil and gas deposits. Eighteen cases were won and two were lost. Judgments and compromises have been received in the amount of \$39,765.65. Payments in the amount of \$22,865.26 were collected.

Cases of trespass on public lands included the following: Timber, 612; coal, 67; grazing, 17; turpentine, 1; unlawful inclosures, 11. The following sums were accepted in these cases in settlements: Timber, \$18,215.23; coal, \$2,770.54; grazing, \$4.

On June 30, 1940, there were 339 permanent employees of the General Land Office in Washington, 69 in the District Land Offices in addition to 23 Registers, 164 in the Cadastral Engineering Service, 18 in the Oregon and California Revested Lands Administration, 2 in the Range Development Service, and 6 in the Alaskan Fire Control Service.

THE PUBLIC LANDS

Surveyed and unsurveyed public lands.—The original public domain, exclusive of Alaska, aggregated 1,442,200,320 acres. As of June 30, 1940, 1,320,289,876 acres had been surveyed, leaving 121,910,444 acres unsurveyed.

In Alaska, embracing about 378,165,760 acres, the area surveyed as of June 30, 1940, was 2,245,862 acres, leaving 375,919,898 acres unsurveyed.

Vacant and unreserved public lands; grazing districts.—On June 30, 1940, the area of the vacant and unreserved public lands, exclusive of Alaska (unreserved except for the general orders of withdrawal issued in 1934 and 1935) aggregated 47,899,800 acres outside of grazing districts and the area of public lands within such districts and subject to grazing use was 138,639,718 acres. The area which was vacant and unreserved, in Alaska, on the date mentioned is estimated at 323,000,000 acres.

Areas under lease.—At the close of the fiscal year there were outstanding 5,103 mineral permits, leases, and licenses embracing 5,095,380 acres and 5,646 leases for grazing and purposes other than mineral, embracing a total of 8,395,471 acres.

Pending entries.—There were outstanding at the close of the year 9,703 entries embracing 2,373,542 acres, compared with 15,902 entries covering 5,098,829 acres, outstanding at the close of the preceding year. The decrease is due to the conservation program, which prevents the allowance of new entries, with certain exceptions, until after the classification of the lands; to the completion of many outstanding entries by the submission of satisfactory proofs, and to the cancellation of other entries for failure of the claimants to submit timely or satisfactory proofs.

Withdrawn and reserved areas.—The activities of the General Land Office extend in many ways to public lands which have been reserved or set aside for public purposes. These areas include public lands in national forests (subject to the operation of the mineral, national-forest homestead, and other public-land laws), public lands in grazing districts (subject to the operation of the mineral and other public-land laws as provided for by the Taylor Grazing Act), the revested Oregon and California railroad and reconveyed Coos Bay Wagon Road lands in Oregon, stock driveways, lands in which mineral and other rights have been reserved in patents heretofore issued, power-site withdrawals and classifications, lands withdrawn under the act of June 25, 1910, reclamation projects and former Indian lands. The withdrawn and reserved lands, some of which include overlapping areas, embrace more than 300,000,000 acres.

CADASTRAL ENGINEERING SERVICE

The Cadastral Engineering Service of the General Land Office executes cadastral surveys and resurveys of the public lands in the United States and Alaska; supervises mineral surveys for patent purposes; prepares the field notes and plats for such surveys; and acts as custodian of the records.

Cadastral engineering activities were carried on in 23 States and the Territory of Alaska, under 215 separate groups, 107 of which in 16 States were resurvey projects. A total of 35,549 miles was surveyed and resurveyed, embracing 5,693,105 acres, in addition to engineering field investigations, miscellaneous surveys, and special projects not measurable on a quantity basis.

In response to requests, surveys and resurveys were made for the Grazing Service, National Park Service, Bureau of Reclamation, Geological Survey, Office of Indian Affairs, and Biological Survey of the Department of the Interior, also for the Forest Service of the Department of Agriculture, and the Department of Justice, and to meet the requirements of location, description, title, exchange, and lease under the public-land laws and policies of the United States.

Survey field notes, 368 township base plats, 158 color overlay sheets, 204 supplemental plats, and 62 special plats of miscellaneous surveys were prepared in final form for the permanent record. In addition, 142 mineral surveys, embracing 450 locations, were examined, platted, and approved.

Accepted surveys and resurveys.—There were accepted and placed on file plats representing 1,340,508 acres of original surveys of public lands and, in addition, 2,878,172 acres of lands were resurveyed, comprising an aggregate area of 4,218,680 acres.

Maps, plats, and diagrams.—The wall map of the United States has been revised to show changes since the publication of the 1938 edition.

A new map of Idaho, showing changes since the 1932 edition, is now being printed.

There have been prepared 391 miscellaneous maps, plats, diagrams, and tracings.

Photolithographic copies, etc.—There were sold 8,476 photolithographic copies of township plats, for which \$4,238 was received; and 6,474 copies were furnished the Bureaus for official use. There were 1,675 maps mounted and distributed for official use, and appropriate distribution was made of 3,315 map publications and 100,801 circulars.

**FORESTRY ON THE REVESTED AND RECONVEYED LANDS IN
WESTERN OREGON****Resources**

Forestry on the revested Oregon & California Railroad (O. & C.) and the reconveyed Coos Bay Wagon Road grant lands, located in 18 counties in western Oregon and aggregating approximately 2,500,000 acres, presents one of the most challenging problems in American forestry. The area contains a total merchantable volume of approximately 50,000,000,000 board feet measure of principally Douglas fir timber. The economic and social importance of these resources, both locally and nationally, places them in the front rank of American forests and calls for the best there is in American forest administration.

Corrective Legislation

The act of August 28, 1937 (50 Stat. 874) laid the foundation and framework for a sound forest policy covering these valuable forest resources. This measure provides for the conservation of land, water, forest, and forage on a permanent basis; the utilization of these resources for the purposes to which they are best adapted; and the realization of the highest current income consistent with sound administrative management. It seeks, through the application of the principle of sustained-yield management, to provide perpetual forests which will serve as a foundation for continuing industries and permanent communities. Since the enactment of the 1937 act, two other laws have been passed to assist in the administration of the O. & C. lands, namely, the act of May 24, 1939 (53 Stat. 753), making provision for the disposition of funds derived from the Coos Bay Wagon Road grant lands, and the act of July 31, 1939 (53 Stat. 1144), authorizing the exchange of the reconveyed lands for lands in State, county, or private ownership in order to consolidate the holdings of the United States.

Forest Policy

The new forest policy which has been formulated for the administration of the revested and reconveyed Oregon grant lands includes some of the most progressive features in American forestry. It aims to place the administration of these lands in the front rank of industrial forestry in the United States and to set an outstanding example for the practice of cooperative sustained-yield forestry in America. The cutting of the timber is being restricted to a volume of 500,000,000 feet board measure per annum pending the completion of a survey of the property and the formulation of a detailed plan of management. Such cutting is directed under rules of forest practice providing for

partial or selective logging in its various forms of tree, group, and area selection. Regulations providing for the sale of timber were approved by the Secretary of the Interior under date of July 7, 1938, and regulations providing for the leasing of grazing privileges were approved July 6, 1939.

Progress in Organization

The law making the practice of sustained-yield forest management mandatory was approved on August 28, 1937. However, funds were not made available for the administration of the project until July 1, 1938, at which time a total of \$135,000 was provided for administration and protection. Of this total, \$74,000 was set aside for fulfilling contracts for protecting the lands from fire, leaving a balance of \$61,000 for timber-sale administration and for organizing the enterprise. An amount of \$160,000 was authorized for the fiscal period ending June 30, 1940, \$80,000 of which was set aside for protection, thus leaving an equal amount for timber-sale supervision, the conducting of investigations, and the formulation of plans. The appropriation for the year beginning July 1, 1940, is the same as for the preceding year.

The problem of finances has been a matter of serious concern to the Department since the regular funds made available have not been sufficient to permit of completing the investigations essential to the effective administration of the property. This handicap has been overcome to some extent by the allocation of \$100,000 from Public Works funds, and it now appears that the greater part of the work of investigation and planning will be completed during the fiscal year 1941. The act of August 28, 1937, authorizes appropriations for administration of 25 percent of the revenues derived from the sale of timber, and experience has demonstrated that sound management is possible of attainment on this basis. However, investigation, classification, and planning costs are not direct charges against administration and should not be so interpreted.

An appraisal of the current status of the O & C project shows the marked progress which has been made in carrying out the requirements of the 1937 act. Within a period of 2 years a well-balanced technical organization has been established; the principles of selective cutting and sustained-yield management have been introduced; a large volume of improvement work, including the establishment of forest nurseries and forest plantings, has been carried out; and, finally, work in assembling the forest and economic facts essential to the division of the area into sustained-yield units is nearing completion.

Results of Operations

Although the enactment of the act of August 28, 1937, required a drastic reorganization of the entire O. & C. project, the prevailing demand for timber made it necessary to continue sales at a rate which would keep industry fully supplied.

The cash income from timber operations for the 3-year period ended June 30, 1940, totaled \$1,886,151, namely, \$614,663 for the year 1938, \$421,266 for 1939; and \$850,222 for the fiscal year 1940. These results reflect an average annual income of \$628,717 for the period under review. The average annual cash income from these lands for the past 3 years materially exceeds that which was realized during the preceding 20 years, namely, 1918 to 1937, inclusive. During this period a total cash income of \$9,041,332 was received from the sale of timber. This result reflects an average annual income of \$452,066 or \$176,651 less than that for the 3-year period just ended.

The total cash income received during the period 1938 to 1940, in which the property has been administered under principles of sustained yield, was \$1,886,151. The total cost of administration and protection during this same period was \$455,000, thereby reflecting a net income of \$1,431,151 and a ratio of cost to income of less than 24 percent. The volume of timber-sale business carried out in 1940 exceeds that of any former fiscal period since 1918, making an exception of the single year of 1924. The volume of timber sold increased substantially during 1940, and it is expected that there will be a further increase in production during 1941. However, current depletion is still well under the sustained-yield capacity of the O. & C. forests, thus leaving a comfortable margin for expansion.

RANGE DEVELOPMENT SERVICE

Appropriation

Under the act of May 10, 1939 (53 Stat. 691), \$60,000 was appropriated for the construction, purchase, and maintenance of range improvements on the public lands subject to grazing leases under the provisions of section 15 of the Taylor Grazing Act of June 28, 1934, as amended (48 Stat. 1269; 49 Stat. 1976), with the limitation that expenditures for the purpose named should not exceed 25 percent of the receipts during the fiscal years 1939 and 1940. The receipts for these years totaled \$289,743.47.

Allocation of Funds

The expenditures for range improvements, including administration, were \$38,052.62. Improvements were made in the States of Wyoming and Montana, in nearly equal ratio, these States having contributed

approximately 60 percent of all receipts received from the grazing leases. As additional funds are appropriated equitable distribution thereof will be made among the other contributing States.

Range Program

In Wyoming the principal range improvement consisted in the development of watering places for stock. In Montana the development of springs, the construction of stock-watering reservoirs, and fencing, comprised the chief activities. Most of the improvements are so located as to benefit the greatest number of stockmen in the area. In many cases cooperative agreements were entered into between the United States and the lessees, whereby the lessees agreed to contribute labor in constructing the projects, and maintaining them, after completion.

Range Improvements

In Wyoming, 44 range improvements, benefiting 255,830 acres, were constructed at a cost to the United States of \$17,770.94, and in Montana 43 range improvements, benefiting 267,394 acres, were constructed at a cost to the United States of \$14,320.79.

THE ALASKAN FIRE CONTROL SERVICE

Protection of Forests on Public Lands in Alaska

The General Land Office is charged with the administration of approximately 325,000,000 acres of public domain in the Territory of Alaska, of which approximately 250,000,000 acres are in need of fire protection. The magnitude of this protection problem can be better realized by stating that this area is about 60 percent greater than is that of all the national forests of the continental United States. The area in need of protection consists of approximately 40,000,000 acres of fairly dense forests of white spruce and birch, 110,000,000 acres of open woodland and interspersed grasslands, and 100,000,000 acres of tundra vegetation in the extreme north and northwest sections of the Territory.

The interior of Alaska has an annual precipitation of less than 15 inches and the summers are long and dry with almost continuous daylight. The fire hazard is extremely high and this fact, coupled with a lack of appreciation of the ill effects of fire by the general public, has resulted in serious losses annually since the development of Alaska was initiated.

Although officials of the Department of the Interior and the General Land Office have recognized the need for a protection program for the forests of the interior of Alaska over a long period of years, no funds

were provided for this purpose prior to the year 1939. An item of \$37,500 was included in the Department Appropriation Act for the fiscal year 1940 for the prevention and suppression of fires on the public domain of Alaska. While it is realized that this appropriation, which represented only one-half of the amount recommended, was inadequate, a fire-protection unit, directed by a forester with many years of experience in the Territory, has been organized; this skeleton organization is supplemented by the Civilian Conservation Corps, and major forward steps have been taken looking to the solution of the problem.

Program

The program during the year 1940 consisted principally of the conducting of a vigorous educational campaign with a view to enlightening the public upon the economic importance of the destructible resources of Alaska, the seriousness of the fire situation, and the direct losses which were being sustained by the Territory largely as a result of human carelessness. Active cooperation was secured from the public, the Federal agencies operating in Alaska, newspapers and radio stations, local organizations, chambers of commerce, and sportsmen's clubs. A short-term course on forest conservation and protection was conducted in cooperation with the University of Alaska.

The establishment of an adequate system of protection for the forests of Alaska is a matter of vital concern to the Nation, especially in view of the existing emergency. Defense activities in progress and those in prospect will greatly increase the fire hazard, and serious losses will result unless the protection organization is materially strengthened.

CIVILIAN CONSERVATION CORPS

Conservation of Forest Resources on the Oregon & California Revested Lands in Oregon

Conservation program.—The vast timber resources of the nearly 2,500,000 acres of the Oregon & California revested railroad grant lands are managed on a sustained yield basis for the purpose of providing a continuous forest crop to maintain and stabilize local forest industries.

The Civilian Conservation Corps assisted in attaining this objective through the camps in Oregon assigned to the General Land Office, by providing facilities for increased protection and more efficient utilization of the forest resources.

The more important types of work engaged in were:

Truck trail construction.—The construction of forest truck trails or roads was one of the more important jobs conducted in the camps. Their value for protection is of paramount importance, as they fur-

nish fire-fighting crews a means of quick access into the more generally inaccessible forest areas. Work accomplished during the year included the construction of 42.9 miles of roads, the maintenance of 114.5 miles of truck trails, and the building of 15 vehicle bridges.

Fire suppression.—The General Land Office camps have been of great value in preventing and suppressing forest fires. There were 58 fires worked on and controlled.

Reforestation.—A considerable portion of the Oregon and California lands is not reforesting naturally, and many acres of Oregon's most valuable forest land have been made nonproductive through successive burning. By artificial reforestation and protection these lands can be made to produce forest products from which commensurate returns may be expected. Nine hundred thousand seedlings were planted on 1,010 acres.

In connection with the reforestation work, a forest nursery with an annual capacity of 1,000,000 seedlings is being operated. Port Orford cedar is the principal species being grown, although 200,000 ponderosa pine and an approximately equal number of Douglas fir seedlings, which will be used in field planting of denuded areas, are growing.

Fire hazard reduction.—A total of 44.9 miles of roadsides was cleaned up and much other fire hazard reduction work was done.

Tree and plant disease control.—The work of controlling the white pine blister rust in valuable Oregon and California sugar pine areas in southern Oregon, carried on in cooperation with the Bureau of Entomology and Plant Quarantine and the United States Forest Service, was completed on 735 acres.

Telephone lines.—A total of 22.7 miles of new forest protection telephone lines has been completed and an additional 24.2 miles have been rebuilt and maintained. A total of 1,036 man-days of labor was used.

Miscellaneous.—In addition to the work listed above, the camps engaged in other activities, such as the construction of buildings, guard rails, and horse trails, surveying seed collections, mapping, etc.

Safety program.—The camps have enjoyed a year which has not been marred by any serious accidents.

Control of Coal Fires in Wyoming

Working under the supervision of the General Land Office, the Civilian Conservation Corps has saved an incalculable amount of the Nation's coal resources from destruction by controlling the underground coal fires that for many years have been consuming many of the large coal beds in public lands in the vicinity of Little Thunder Basin, Wyo.

During the year 13 separate coal-bed fires were worked upon. Three of the projects were definitely completed and work is progressing satisfactorily upon the others. One fire of very recent origin was taken out completely in 16 working days.

There yet remain several other coal-bed fires near Gillette, Wyo., upon which work must be done in order to prevent the destruction of this irreplaceable natural resource.

LAND CLASSIFICATION

Objectives

Problems relating to the classification of the public lands under the administration of the General Land Office have been dealt with by the Branch of Planning, Use, and Protection. The broad objective has been the promoting of conservation and prudent use of the public domain. Land Classification has been utilized to prevent disposal of the public lands for purposes inconsistent with their use capabilities. Lands embraced in homestead, public sale, and other applications have been classified to the end that disposal will not be detrimental to the applicant, the local community, or the general public. At the same time, it has been recognized that the public interest demands the fullest beneficial use of the public lands consistent with their use capabilities. Therefore, classification of the public domain has also proceeded in terms of recommended uses and attention has been given to policies and programs necessary to effectuate these uses.

Classification Reports

The work of land classification in the General Land Office was begun about February 1, 1940. During the balance of the fiscal year definite progress was made toward classifying lands embraced in pending applications. More than 850 classification reports were prepared during that period. The lands covered by the classification reports were located in 23 of the 25 public land states and were applied for under the homestead, public sale, desert land, timber and stone, lieu selection, exchange, and other provisions of the public land laws.

As an integral part of classification, it has been necessary to assemble and analyze basic data pertaining to land characteristics and conditions of land use. These data, including reports and maps prepared by agencies both within and outside of the Department, will, in time, constitute a land use reference library.

Platting the Public Domain

To aid classification, the public domain has been platted in part, in sufficient detail to reveal the distribution pattern of the public lands and their relation to privately and other publicly owned lands. As this work progresses, it is believed that certain exchanges and consolidations which would facilitate beneficial use of the land may be determined from the plats.

Land Classification in Alaska

Coincidental with the classification of the public domain in continental United States, preliminary field work has been initiated for the classification of the public lands in the Territory of Alaska. The importance of this classification has been increased by recent interest in the constructive development of the territorial resources. The work will proceed in cooperation with other bureaus of the Department and with other departments.

RESEARCH AND ANALYSIS

Organization and Problems

A Research and Analysis Division has been established in the General Land Office to aid in administering the conservation program.

The first approach of the Division to the problems at hand was to inventory certain portions of the remaining public domain. It has completed or has under completion several projects of this kind.

Mineral Reservations in Outstanding Patents

The first project involved the collection of statistical data showing mineral reservations in patents issued since 1910. These data have been abstracted up to 1936. The records indicate that up to such date almost 200,000 patents, embracing 36,000,000 acres, had been issued, in which some or all of the minerals are reserved to the Federal Government.

Federal Land Inventories

The second project consisted of inventorying the vacant, unappropriated, and unreserved public land in the public-land States having no district land offices. This work is nearly completed.

The third project consisted of an inventory of all Federally owned lands in the United States outside the corporate limits of municipalities, and the recording of such lands on county maps and standard forms. This project was transferred from the National Resources Planning Board, as of January 17, 1940.

ra

Project units were set up in cooperation with the Work Projects Administration in the General Land Office, all district land offices and several public survey offices. The first step is to secure information concerning all Federally owned lands of record in these offices. It is estimated that about 20 percent of the inventory has been completed.

Town Site Project

A fourth project which deals with an interesting chapter of the development of the West consists of a compilation of information concerning town sites which have been established by the General Land Office on public land.

Need for Better Records

Consideration is being given to the establishment of a card-index system, to supplement the existing tract book, patent and general file records, with respect to individual tracts of present or former public lands.

RECEIPTS AND EXPENDITURES

General.—The total cash receipts from leases, sales, and other disposals of public lands (including receipts from copies of records, sales of Government property, etc.) were \$7,017,023.18 and from Indian lands \$40,918.98, an aggregate of \$7,057,942.16, all of which was deposited in the Treasury. The total expenditures from appropriations made for the conduct of the Bureau were \$2,237,720.10. The excess of receipts over expenditures was \$4,820,222.06. Collections under section 3 of the Taylor Grazing Act were transferred to the Grazing Service as of July 1, 1939.

Receipts under mineral leasing acts.—Receipts from bonuses, royalties, and rentals under laws providing for the leasing rights on the public domain (including royalties and rentals on potash deposits and royalties on coal leases in Alaska) aggregated \$5,637,153.11, of which \$5,201,995.43 was received under the act of February 25, 1920 (41 Stat. 437).

The largest receipts under this act were from lands in California, the amount being \$2,120,198.05. Wyoming was second with \$1,742,103.97. Receipts from other States follow: New Mexico, \$851,093.06; Utah, \$141,373.28; Colorado, \$116,401.92; Montana, \$114,533.30; Louisiana, \$80,094.62; North Dakota, \$18,898.78; Alabama, \$5,782.30; Arizona, \$3,739.66; Washington, \$3,353.76; Oklahoma, \$1,804.15; South Dakota, \$806.71; Kansas, \$738.25; Idaho, \$643.83; Nebraska, \$220; Nevada, \$157.29; and Michigan, \$52.50.

Under the provisions of the mineral leasing act cited, each State receives $37\frac{1}{2}$ percent of the receipts from the public lands within its borders, the reclamation fund receives $52\frac{1}{2}$ percent and the other 10 percent remains in the Treasury of the United States as a part of the general fund.

Receipts under the Taylor Grazing Act.—Fees and rentals from leases issued for public lands under section 15 of the act amounted to \$152,378.34. The largest receipts were from lands in Wyoming, where \$69,556.41 was collected. Receipts from other States were as follows: Arizona, \$22,383.38; Montana, \$18,223.33; New Mexico, \$9,735.03; Colorado, \$8,789.09; California, \$8,016.06; Idaho, \$6,195.41; Oregon, \$4,843.17; South Dakota, \$2,304.38; Washington, \$2,258.27; Arkansas, \$36.07; Oklahoma, \$27; and Nebraska, \$10.74. The States within which the lands are situated will receive 50 percent of these receipts.

Distribution of receipts.—Receipts from all sources, aggregating \$7,057,942.16, as shown above, are distributed under the law approximately as follows: Reclamation fund, \$3,055,719.63; for range improvements, \$71,399.77; to public land States and certain counties within such States, \$2,848,406.28; to various Indian tribes, \$36,762.85; and to the general fund of the Treasury, \$1,045,653.63.

Under the provisions of the Taylor Grazing Act, the States within which the lands are situated receive 50 percent of the receipts from public lands and 25 percent of the receipts from ceded Indian lands; 25 percent of the receipts from both public and ceded Indian lands is available, when appropriated by Congress, for range improvements; 50 percent of the receipts from ceded Indian lands is credited to the Indians; and the balance is credited to the general fund in the Treasury.

Five percent of the net proceeds from cash sales of public lands is paid to the public-land States within which such sales were made, and the balance of such receipts from States named in the Reclamation Act is credited to the reclamation fund; the reclamation fund and the States involved receive 90 percent ($52\frac{1}{2}$ percent and $37\frac{1}{2}$ percent, respectively) of the receipts under the mineral leasing act and of receipts from potash deposits leased under the act of February 7, 1927; receipts from sales of reclamation town sites and camp sites and from royalties and rentals from potash deposits leased under the act of October 2, 1917, are credited to the reclamation fund; 75 percent of the receipts from the Oregon & California Railroad grant lands is paid to the counties within which the lands are situated and 25 percent is credited to the general fund of the Treasury. Not to exceed 75 percent of the proceeds of land and timber in the forfeited Coos Bay Wagon Road grant is paid in lieu of taxes to the

counties within which the lands are situated. The balance of such proceeds is credited to the general fund in the Treasury. The receipts from Indian lands (except 37½ percent of royalties from Red River oil lands which is paid to the State of Oklahoma in lieu of taxes) are deposited in the Treasury to the credit of the various Indian tribes. All other moneys are deposited in the Treasury to the credit of the general fund.

The following table shows in detail the distribution of the receipts insofar as is possible before final settlement of all accounts by the General Accounting Office:

	Distribution in the Treasury				
	General fund	Reclamation and range improvement	State and county funds	Trust funds	Total
Sale of public lands.....	\$71,262.18	\$41,251.90	\$4,688.09		\$117,202.17
Fees and commissions.....	14,103.00	51,854.72			65,957.72
Receipts from mineral leases.....	539,780.83	2,731,047.60	1,950,748.29		¹ 5,221,576.72
Receipts from Oregon & California R. R. grant lands.....	186,202.12		558,606.36		744,808.48
Receipts from Coos Bay Wagon Road grant lands.....	60,413.88		² 45,000.00		105,413.88
Receipts under Taylor Grazing Act:					
Sec. 3 (within grazing districts).....	33,048.84	33,305.19	66,354.04	\$512.67	³ 133,220.74
Sec. 15 (outside grazing districts).....	38,094.59	38,094.58	76,189.17		152,378.34
Potash royalties and rentals.....	37,907.08	226,978.90	142,151.53		⁴ 407,037.51
Rental for rights-of-way:					
Power transmission lines.....	16,068.05				16,068.05
All other.....	6,597.88				6,597.88
Sale of reclamation town lots.....		4,586.51			4,586.51
Sale and lease of Indian lands.....			4,668.80	36,250.18	⁵ 40,918.98
Copying fees.....	18,384.51				18,384.51
Miscellaneous (including sale of standing timber, coal leases and town lots in Alaska, rent of land, etc.).....	23,790.67				23,790.67
Total.....	1,045,653.63	3,127,119.40	2,848,406.28	36,762.85	7,057,942.16

¹ First and last columns include \$19,581.29 royalties received in Wyoming under the act of June 26, 1926.

² Estimated.

³ This amount was collected prior to July 1, 1939, but not covered into the Treasury until the current fiscal year.

⁴ Second and last columns include \$27,966.76 royalties received in California under the act of Oct. 2, 1917. The balance of this item represents royalties and rentals under the Act of Feb. 7, 1927.

⁵ Includes \$12,456.51 royalties and rentals from oil and gas leases for Kiowa, Comanche, and Apache lands south half of Red River, Okla., of which the State receives 37½ percent of the royalties in lieu of taxes.

REPAYMENTS

The act of June 16, 1880 (21 Stat. 287), and the act of March 26, 1908 (35 Stat. 48), as amended by the act of December 11, 1919 (41 Stat. 366), provide for the return of moneys received in connection with the disposal of public lands and covered into the United States Treasury.

Repayment may be made to the land applicant or his heirs or assigns, where lands have been erroneously sold, where payments have been made in excess of lawful requirement, and where applications, entries, and proofs have been rejected, no fraud appearing. Under said laws

there were stated 52 accounts, allowing repayment of \$7,399.75, and 10 claims were denied. The claims allowed include one account granting repayment of \$10 received in connection with a homestead entry of ceded Indian lands and repaid from Indian trust funds.

MINERAL LEASES AND MINING CLAIMS

Oil and gas leases and permits.—On June 30, 1939, there were outstanding 2,353 leases issued under the act of February 25, 1920, and the amendatory act of August 21, 1935. During the fiscal year 1940, 2,084 new leases were issued and 69 leases were canceled, leaving on June 30, 1940, a total number of 4,368 leases outstanding for an aggregate of 4,703,934.88 acres. Except for 126 permits remaining in Alaska all permits have expired and the permit system has been superseded by a leasing system.

Coal, potash, phosphate, sodium, and sulphur permits, leases, and licenses.—On June 30, 1939, 369 coal leases for 68,552.20 acres were outstanding; 15 leases were issued and 19 leases, including one in part, were canceled, leaving 365 coal leases outstanding for an area of 68,050.47 acres. Coal permits outstanding on June 30, 1939, numbered 121 for 92,566.48 acres; 31 new permits were issued, 9 coal permits, including two in part, were canceled, and 7 permits expired, leaving outstanding 136 coal permits for 105,106.08 acres. Coal licenses outstanding on June 30, 1939, numbered 85 for 3,301.71 acres; 13 new coal licenses were issued, one license was canceled, and three licenses expired, leaving on June 30, 1940, 94 coal licenses for 3,631.53 acres.

There were on June 30, 1939, 16 potash leases embracing 40,882.66 acres; five leases were issued, increasing the potash leases to 21 for a total of 47,092.10 acres. The 12 potash permits covering 15,274.49 acres, which were outstanding at the beginning of the year, expired; no permits were issued, action thereon being suspended in accordance with departmental order No. 914 of April 5, 1935.

The status of the 7 outstanding phosphate leases covering an area of 3,292.90 acres remained unchanged; no leases were issued, action thereon being suspended in accordance with departmental order No. 1294 of July 2, 1938.

The 3 sodium leases covering 1,191.88 acres and outstanding on June 30, 1939, remained intact; sodium permits outstanding increased from 43, covering 66,742.37 acres, to 80, embracing 144,567.37 acres, when 54 new permits were issued; 3 permits, including one in part, were canceled and 14 permits expired.

Twenty-seven sulphur permits were in effect on June 30, 1939, covering 17,508.01 acres; 11 new permits were issued; 9 permits expired,

leaving on June 30, 1940, 29 sulphur permits outstanding, embracing 18,517.29 acres.

Mineral applications and entries.—There were 85 mineral applications awaiting action on June 30, 1939; 28 new applications were received and 39 applications were finally disposed of, leaving 74 applications, embracing 4,336.80 acres. On June 30, 1939, there were pending 105 mineral entries, for 6,098.40 acres; 123 new mineral entries were received; patents issued for 133 entries, embracing 6,952,326 acres, leaving pending on June 30, 1940, 95 mineral entries, covering 5,364,074 acres.

Mineral contests.—On June 30, 1939, there were 35 mineral contests pending; during the year 113 new contests were received; 108 were finally disposed of, leaving on June 30, 1940, 40 contests pending.

RIGHTS-OF-WAY

X / Five hundred and seventy-four new applications for railroads, reservoirs, telephone and telegraph lines, public roads, pipe lines, etc., were received, which, added to 162 pending, made a total of 736. Four hundred and sixty-two were approved or otherwise disposed of, leaving 274 pending. Seventy-seven maps of approved rights-of-way in Indian and forest reservations were received and the approvals promulgated.

There were received for action requiring proof of construction 67 cases which, added to 539 awaiting action, made a total of 606. Seventy-six of these cases were acted upon, leaving 530 pending.

FEDERAL RECLAMATION PROJECTS

X / There are 45 Federal reclamation projects in 14 western States, 35 of which are operated in whole or in part by the water users. There are, in addition, 5 Indian reclamation projects, the irrigation features of which are under the supervision of the Office of Indian Affairs.

One thousand and fifty reclamation cases of various kinds were received and 1,000 were acted upon. One hundred and sixty-three reclamation entries were patented, containing 14,144.34 acres.

DESERT-LAND ENTRIES

X / Eighty-four entries involving 13,239.65 acres were patented under the desert-land laws which provide for entries by individuals, who are required to irrigate and cultivate the lands.

CAREY ACT

Carey Act segregations amounting to 50,238.48 acres were considered under the act of August 18, 1894 (28 Stat. 422), known as the Carey Act, which was designed to encourage large-scale reclamation of arid lands in certain States. The lands must be reclaimed by the States and disposed of by them to actual settlers. One application under the act of March 15, 1910 (36 Stat. 237), requesting the temporary withdrawal of 12,711.92 acres, is pending.

PITTMAN ACTS

The patenting of public lands in Nevada on the discovery and development of underground waters is authorized by the Pittman Acts of October 22, 1919 (41 Stat. 293), and September 22, 1922 (42 Stat. 1012). There were pending 21 cases; 18 were received; total, 39. There were patented 3 cases; 33 were otherwise disposed of; pending, 3.

SWAMP AND OVERFLOWED LANDS

Under the Swamp-Land Acts which were intended to aid the States in reclaiming lands by the construction of permanent levees, there were approved and patented to the States 2,561.39 acres. Claims for 3,538.61 acres were finally rejected. New claims were asserted for 4,256.25 acres.

STATE GRANTS AND SELECTIONS

The area of the indemnity school selections on hand and received for consideration amounted to 347,395.22 acres. Selections embracing 117,482.30 acres were approved and title conveyed to the States. Canceled selections included 1,698.97 acres. Selections aggregating 228,213.95 acres were pending at the close of the year.

Selections under quantity grants to States for specific purposes, embracing 7,400.40 acres, were approved and title conveyed to the States. Title to 40 acres was confirmed by the issuance of a supplemental patent. The selections pending at the close of the year embraced 169,384.49 acres.

Applications for patents for granted school sections under the provisions of the act of June 21, 1934 (48 Stat. 1185), were approved to the extent of 793,846.58 acres. New applications embracing 464.96 acres were received. Such applications pending at the end of the year embraced 691,533.03 acres.

EXCHANGES WITH STATES

New applications by the various States, under the Taylor Grazing Act, for exchanges of lands embracing 60,004.44 acres were received. Sixty-four patents containing 185,571.81 acres, with a reservation of all minerals to the United States were issued. The rejected and relinquished applications involved 746,251.80 acres.

Other State exchanges approved or patented involved 20,780.94 acres.

RAILROAD GRANTS AND SELECTIONS

One new railroad selection embracing 793.86 acres was received and 10,136.61 acres were certified or patented as indemnity selections.

ALASKA

On June 30, 1940, there were 28 fur farm leases outstanding, covering approximately 143,780 acres, the annual rental of which is \$760. Six renewal leases were issued, 6 leases were canceled, 3 applications for lease are pending, and 3 applications for lease were rejected and closed.

Eleven grazing leases, covering approximately 807,832 acres, from which the sum of \$922.55 was received, were outstanding on June 30, 1940. One lease was canceled, 9 applications for lease are pending, and 3 applications for lease were rejected and closed.

The sale of 5-acre tracts in Alaska for homesites or headquarters was considered in 107 instances and 18 patents issued for a total of 61.72 acres, and 2 applications were finally rejected and closed.

The sale of lands in Alaska for trade, manufacturing, or other productive industry sites was considered in 33 instances and 4 patents issued for a total of 75.93 acres.

AVIATION LEASES

On June 30, 1940, 22 aviation leases, covering 11,056.92 acres, and 5 beacon-light permits, covering 954.84 acres, were outstanding. Five leases were canceled, 1 new lease and 4 renewal leases were issued, and 3 applications for lease are pending.

COLOR OF TITLE

General color-of-title claims were considered in 142 instances and 16 patents issued for a total of 511.34 acres, while 13 applications were finally rejected and closed. Two applications involving Texas-New Mexico color-of-title claims were finally rejected and closed. One case under a special act involving land in Utah, claimed under color of title, is pending.

EXCHANGES

Existing laws authorize the Secretary of the Interior to acquire title to privately owned lands in exchange for Government lands in promoting matters of public interest, such as the establishment of grazing districts, wildlife and bird refuges, the elimination of private holdings within national parks, monuments, and Indian reservations, the grouping of Government lands and State-owned lands, and the consolidation of national forests and Government timberlands. Exchanges were consummated which resulted in additions to Indian reservations of 183,748.17 acres in exchange for 190,498 acres of Government land; to national monuments of 2,563.38 acres in exchange for 5,106.98 acres of Government land; to grazing districts of 4,360 acres in exchange for 3,543.95 acres of Government land; and to national forests of 302,215.67 acres in exchange for 43,371.52 acres of Government land and timber, timber being permitted in these cases and timber being the consideration given by the Government in 80 percent of the forest exchange cases. Exchanges are nearing completion which will result in the addition of approximately 5,300 acres of privately owned land to a bird and wildlife refuge in exchange for approximately the same amount of Government land. These exchanges necessitated the examination of abstracts and other evidence in the acceptance of title in behalf of the United States to a total of 492,887.22 acres and the issuance of patents for the total of 242,520.45 acres.

A proposed forest exchange involving 10,000 acres of privately owned land was held as not being in the public interest and was rejected and closed, while two exchange proposals, involving 10,000 acres of privately owned land in a national forest for approximately 100,000 acres of grazing district land, were rejected and closed.

GRAZING LEASES

During the year, 1,673 offers of grazing leases were made under section 15 of the Taylor Grazing Act, involving approximately 1,604,595 acres, with an annual rental of \$30,986.60. Sixty-five leases involving an area of 41,433.87 acres with annual rentals totaling \$960.90 were canceled. There were outstanding on June 30, 1940, 5,559 leases covering an area of 7,411,986.77 acres, with a total rental of \$149,506.88. Approximately 550 applications for lease were finally rejected and closed and 1,749 applications are pending.

INDIAN LANDS AND CLAIMS

In former Indian reservations, ceded to the United States for disposition under the public-land laws, 206 homestead entries and purchases were patented and 412 were canceled.

As to Indian claims or allotments, 55 fee patents, 17 trust patents, and 2 Indian homestead patents were issued. A total of 183,748.17 acres was added to Indian reservations through the medium of exchange, and a total of 190,498 acres of Government land was patented to private parties in exchange therefor. Several reports were made concerning the lands available for inclusion within Indian reservations and for restoration to tribal ownership under the Wheeler-Howard Act.

LEASES OTHER THAN AVIATION, GRAZING, AND MINERAL

One hot-spring lease, covering 20 acres in Montana, is outstanding from which the Government received \$344.60 under the terms of the lease.

One medicinal spring lease, embracing 40 acres in California, is outstanding and an annual rental of \$20 was received therefrom.

Sixteen recreational leases, covering 19,639.27 acres, are outstanding.

PRIVATE LAND CLAIMS

Private land claims which had attached to land under foreign sovereignties, prior to the cession of the territory involved to the United States, were considered in 123 instances and 18 patents issued for a total of 8,333.62 acres.

TIMBER

Sales of dead, down, or damaged timber, were considered in 65 instances and the sum of \$434.55 was received therefrom. Free-use timber permits were considered in 32 instances.

TOWN LOTS AND TOWNSITES

Townsite work resulted in the patenting of 171 town lots, the total sale price of which amounted to \$110,720.80. Some of these lots were sold in prior fiscal years and part payments therefor were made during such years. Six townsite patents embracing a total of 74.78 acres were issued. Regulations were issued to govern the sale of lots in three townsites.

MISCELLANEOUS

Other patents were issued covering entries, selections, and claims as follows: Homesteads in abandoned military reservations, 4; military bounty land warrant location, 1; cash entries, 25; credit entries, 3; cemetery site, 1; cash entries under the Arkansas drainage law, 3; forest lieu selections, 6; five-acre homestead tracts in Alaska, 18; claims of non-Indians in Indian pueblos in New Mexico, 2; parks, 2; riparian

right claims, 3; scrip locations, 3; small holding claims, 2; and soldiers' additional homestead entries, 16. There were also 9 quitclaim deeds issued.

HOMESTEAD ENTRIES

Actions were taken in homestead cases as follows: On final and commuted homesteads, 4,061, of which 3,228 were patented for an area of 1,243,467 acres. There also were acted upon applications to make homestead entry, 1,638; applications to amend, 88; applications for leaves of absence, 81; applications for extension of time to establish residence, 22; applications for extension of time to make final proof, 68; original homestead entries, 4,519, of which 2,098 were canceled; applications for change of residence requirement, 12; election intermarriage of homesteaders, 3; applications for permission to make final proof outside of land districts, 18; notices of intention to make final proof, 186; appeals from register's and office decisions, 285; and on special agent's reports, 1,158. These figures do not include homestead entries of ceded Indian lands.

PUBLIC SALE AND TIMBER AND STONE APPLICATIONS

Public sale applications under section 2455, R. S., as amended, receiving action were 1,178, of which 48 were patented for an area of 5,871 acres. Timber and stone cases receiving action were 51, of which 4 were patented for an area of 413 acres.

FILING OF PLATS OF SURVEY

Letters of instruction were issued for the filing of 323 plats of survey for lands in States in which there are district land offices. Twenty-six plats were directly filed by this office in connection with which 10 public notices were prepared for lands in states in which there are no district land offices.

NATIONAL FOREST HOMESTEAD LANDS

Nine thousand three hundred and forty-nine acres in national forests which had been listed for homestead entry under the act of June 11, 1906 (34 Stat. 233), were returned to national forests by revocation of the listing orders, and 494 acres were restored to homestead entry under the act.

CONTESTS, OTHER THAN MINERAL CONTESTS

Three hundred sixty-four contests, including both Government and private, were considered. Approximately 136 hearings were held in Government proceedings. At the close of the year about 116 contest cases were pending.

TRACT BOOK NOTATIONS

The General Land Office maintains about 4,000 tract books in which notations are made of all transactions affecting the public lands. These volumes are designed to show at all times the status of each smallest legal subdivision of the public lands. More than 100,000 notations were made on these records during the fiscal year.

STATUS SHEETS

A total of 15,857 status sheets giving the status of particular lands, with respect to conflicts, rights-of-way, withdrawals, etc., were prepared for use in the adjudication of applications, entries, etc.

TOWNSHIP DIAGRAMS

There were prepared 1,750 township diagrams showing lands disposed of by the Government in particular townships and fractional townships and the status of the remaining lands in such townships. Some of these plats were made on request of individuals who tendered the required payment therefor.

SUPPLEMENTAL PATENTS

The act of April 14, 1914 (38 Stat. 335), authorizes the issuance of new or supplemental patents, without coal reservations, if, after the issuance of the original patents with such reservations, the lands are classified as noncoal in character. Such new or supplemental patents, without coal reservations, were issued in 376 cases.

WITHDRAWALS AND RESTORATIONS

The area of existing power-site reserves was increased by 3,737 acres. the public water reserves by 1,680 acres, and the lands classified as valuable for hydroelectric power purposes were increased by 8,955 acres. Tracts aggregating 28,000 acres were restored from power-site designations under the Arizona and New Mexico Enabling Act and the Oregon and California Railroad Company Revestment Act, while the areas in reclamation projects under the act of June 17, 1902, were decreased by 363,940 acres.

The Kings Canyon National Park was established in California and the Olympic National Park in Washington was enlarged, involving the reservation of 642,011 acres. One new national monument was created, two were enlarged, and one was reduced, the net decrease being 68,903 acres. The area of the national forests was increased by 4,225,954 acres. Two new wildlife refuges were established and four were enlarged, the increase amounting to 125,807 acres. Withdrawals aggregating 3,727 acres in Alaska and in the States were made for air-navigation sites for the Civil Aeronautics Board and on the recom-

mentation of the Alaska Road Commission, and 49 acres were released from former withdrawals for such use. Two leases involving 5,693 acres were issued under the recreation law to the county of Pima, Ariz., one lease was canceled and one superseded by a grant, and four petitions to lease or purchase were denied. Four new stock driveways were created and eight enlarged. All stock driveways within certain grazing districts, and other driveways outside of grazing districts were reduced or revoked, resulting in a net decrease of 224,675 acres.

A withdrawal of 116 acres was made at the request of the Farm Security Administration for use in resettling farm families in New Mexico. Public lands aggregating 76,731 acres in South Dakota were withdrawn for the use of the Department of Agriculture in connection with a land-utilization project, and a withdrawal for classification and use as a grazing project of all public lands in four counties in that State was revoked as to all lands not now within the project. One withdrawal previously made in aid of a similar project was enlarged and one was revoked, resulting in a net decrease of 93,901 acres. A withdrawal of 21,005 acres in Idaho was made in aid of pending legislation, an agricultural experiment reserve of the Department of Agriculture in New Mexico was increased by 2,554 acres, and other reserves for various purposes were increased by 38,790 acres. A withdrawal of 1,280 acres in New Mexico for archaeological examination was revoked. General withdrawals for classification were reduced by 122,850 acres through the placing of the lands involved in withdrawals for specific purposes.

Mineral Leases, Permits, and Licenses Outstanding June 30, 1940, by Classes

Class	Leases		Permits		Licenses	
	Number	Acres	Number	Acres	Number	Acres
Oil and gas.....	1,265	566,612	136	105,106	94	3,631
Oil and Gas Act, Aug. 21, 1935.....	3,103	4,137,322				
Coal.....	365	68,050				
Potash.....	21	47,092				
Phosphate.....	7	3,292				
Sodium.....	3	1,191	80	144,567		
Sulphur.....			29	18,517		
Total.....	4,764	4,823,559	245	268,190	94	3,631

SUMMARY

Class	Number	Acres
Leases.....	4,764	4,823,559
Permits.....	245	268,190
Licenses.....	94	3,631
Total.....	5,103	5,095,380

Leases Other Than Mineral, Outstanding on June 30, 1940

Class	Number	Acres	Class	Number	Acres
Term grazing leases under Taylor Grazing Act.....	5,559	7,411,987	Recreational leases:		
Grazing leases, Alaska.....	11	807,833	Act of June 14, 1926.....	16	19,639
Fur farm leases, Alaska.....	28	143,780	Act of June 30, 1932.....	1	20
Aviation leases and permits:			Boy Scout lease: Act of Jan. 21, 1927.....	1	80
Leases.....	22	11,057	Water well: Sec. 40, Mineral Leasing Act.....	2	80
Beacon permits.....	5	955			
Mineral or medicinal spring leases.....	1	40	Total.....	5,646	8,395,471

Original Entries and Selections Made During the Fiscal Year Ended June 30, 1940 ¹

	Public land		Indian land	
	Number	Acres	Number	Acres
Homesteads:				
Stock raising.....	5	3,639		
Enlarged.....	6	1,753	1	322
Reclamation.....	162	21,148	23	2,692
Forest.....	13	1,200		
Sec. 2289 et al.....	163	18,389	10	995
Total original homesteads.....	349	46,129	34	4,013
Deserts.....	8	940		
State selections.....	9	1,716		
Railroad selections.....	3	794		
Mineral applications and adverse claims.....	126		1	
Miscellaneous.....	35	210		
Total original entries and selections.....	530	49,789	35	4,013
Indian land, as above.....	35	4,013		
Total.....	565	53,802		

¹ An original entry or selection of public land is one made in pursuance of an act of Congress which prescribes the terms and conditions under which patent may be issued or other evidence of title granted.

Final Entries, or Entries Based on Final Certificates, Issued During the Fiscal Year Ending June 30, 1940 ¹

	Public Land		Indian Land	
	Number	Acres	Number	Acres
Homesteads:				
Stock raising.....	1,172	567,926	102	32,747
Enlarged.....	112	27,199	180	27,741
Reclamation.....	101	9,678	60	6,359
Forest.....	17	1,570	1	60
Commuted.....	13	1,531	17	1,231
Section 2289 et al.....	500	46,111	59	5,366
Total final homesteads.....	1,915	654,015	419	73,504
Deserts.....	77	12,183	1	160
Public auction.....	9	1,331		
Mineral.....	107	7,115		
Miscellaneous.....	165	4,169	45	3,040
Total final entries, all classes.....	2,273	678,813	465	76,704
Indian land, as above.....	465	76,704		
Total.....	2,738	755,517		

¹ A final entry of public land is one upon which final certificate has issued showing that the law has been complied with and that in the absence of irregularity, the entryman or claimant is entitled to a patent. If the requirements of law have been met, the equitable title to the land passes to the claimant upon the issuance of the final certificate.

Patents Issued and Certifications Having the Effect of Patents Made During the Fiscal Year Ending June 30, 1940 ¹

	Number	Acres
Homesteads:		
Stockraising.....	2, 270	1, 124, 558
Enlarged.....	318	70, 128
Reclamation.....	163	14, 145
Forest.....	55	5, 101
Sec. 2289 et al.....	778	77, 673
Total homestead patents.....	3, 584	1, 291, 605
Deserts.....	85	13, 320
Public auction.....	48	5, 871
Timber and stone.....	4	413
Mineral.....	133	6, 952
Railroad.....	6	10, 138
Special acts.....	164	² 1, 177, 400
Miscellaneous.....	1, 185	56, 706
Total patents all classes.....	5, 209	2, 562, 405
Certified to States.....		135, 077
Total patents and certifications.....	5, 209	2, 697, 482

¹ Where upon final examination it is found that an entry or selection is in proper form and that the law has been complied with, a patent conveying the legal title to the claimant is issued. In the case of indemnity State selections, the legal title is conveyed upon approval thereof by the Secretary of the Interior and certification by the Commissioner of the General Land Office.

² Includes 793,847 acres of school section land, patented under the act of June 21, 1934 (48 Stat. 1185).

LANDS PATENTED WITH MINERAL RESERVATIONS

The following table shows the areas patented during the year, and the total areas patented to the close of the year, in which minerals in some form have been reserved to the United States:

Type of Mineral Reserved	Patented Fiscal year ending FY 1940	Total Patented Total through June 30, 1940
all minerals:	Acres	Acres
Stockraising Act, all minerals reserved.....	1, 124, 558	32, 834, 116
Other Acts.....	100, 889	946, 053
All minerals reserved.....	11, 106	10, 830, 587
Coal only reserved.....	20, 244	1, 823, 312
Some named minerals reserved.....		
Total.....	1, 346, 798	46, 434, 068

² Includes coal reserved in combination with other minerals.

Summary of Mineral Land Withdrawals and Classifications Outstanding on June 30, 1940

Class	Withdrawn	Classified	Total
	Acres	Acres	Acres
Coal.....	25, 684, 995	33, 494, 162	59, 179, 157
Oil.....	² 4, 859, 154	71, 884	4, 931, 038
Oil shale.....	5, 989, 949	4, 081, 208	10, 071, 157
Phosphate.....	1, 889, 601	302, 219	2, 191, 820
Potash.....	9, 411, 906		9, 411, 906
Metallic minerals.....	8, 507		8, 507
Total.....	47, 844, 112	37, 949, 473	85, 793, 585

¹ Includes 5,229 acres of coal land reserved for use of the United States (coal reserves Nos. 1 and 2).

² Includes 13,578 acres withdrawn as helium reserve.

THE NATIONAL PARK SERVICE

Arno B. Cammerer, Director

LIFE today in the United States of necessity is keyed to national defense. Our national integrity, our land, our ideals will be preserved only so long as we are prepared to defend them to the limit of our abilities. So too with the national resources with which the Nation has been so signally blessed. We must defend them against waste and overuse, against selfish aggression, even against the waste of nonuse.

The far flung Federal park system, which itself must be defended against aggression, plays an important part in the drama of national defense.

In those parks established in memory of great men or great deeds, the scroll of American history may be read. There we may learn of the strength of our pioneer forefathers who braved the little known sea and less known land; of their struggles when all nature, animate and inanimate, seemed against them. There we learn of their fight, and often their death, for an ideal, that it might be translated into epic history.

And in the wilderness parks we have the best of unspoiled nature that the country has to offer. They are the sanctuaries in which protection is given all forms of life. In them survive forests of rare species; lush meadows, free from grazing for two decades; matchless water resources of inestimable value to nearby communities. These possessions must be protected through the trying times ahead.

A distinct contribution to national virility and stamina, essential to any defense program, will be made through use of these parks. By the inherent nature of their activities they preserve morale, promote physical fitness, sanity, and spiritual well-being. Always a safety valve for the stresses and strains of life, and especially so in this machine age, their conditioning effects will be of prime importance in a program of making the Nation physically fit—the first principle of successful national defense.

It even may not be too fantastic to suggest that many recreational areas within the Federal park system will become proving grounds where the youth of the Nation will learn such new maneuvers of pre-



AMERICA, THE BEAUTIFUL.

Middle fork of the Kings River in the new Kings Canyon National Park, California. Established by Act of Congress dated March 4, 1940, this 44,600-acre Sierra wilderness contains some of the wildest and most beautiful scenery in the United States.



paredness as the northern countries have exhibited—the expert use of skis. The enormous increase in public interest already has produced potential legions of ski troops.

The interpretive program of the Service, which each year is made available to several millions of park visitors, may well be accepted as a potent force in maintaining national equilibrium. It is devoutly to be hoped that this program may be augmented rather than retarded. It would be “penny wise and pound foolish” to curtail a service of such proved value at the moment when its stimulation of appreciation and pride in the scenic resources and historic background of the Nation is a material aid in conditioning citizens for defense.

THE YEAR'S HIGH LIGHTS

Nineteen-Forty has been a year of increase in areas in the Federal park system, of expansion of activities, and of wide shifts in personnel planned to build up an administrative staff with a diversified background of park experience.

The signing by President Roosevelt on March 4 of the act to establish the Kings Canyon National Park, Calif., brought to a successful conclusion a 60-year fight to make that wilderness country a part of the national park system. Under the terms of the act the 4 square miles constituting the General Grant National Park, established in 1890, became the General Grant Grove Section of the Kings Canyon National Park. Redwood Mountain, acquired through purchase, was added to the park by Presidential proclamation on June 21. Superlatively wild mountain scenery and some of the finest remaining virgin groves of giant sequoias are the main features of this new park.

Isle Royale National Park, in northern Lake Superior, authorized in 1931, was established on April 5, 1940, with the acceptance by the Secretary of the Interior of title to the last parcels of land to be acquired on the island. This wilderness island, 44 miles in length, and its surrounding islets form a unique archipelagian national park.

The addition of nearly 200,000 acres to the Olympic National Park, Wash., brought into that unit unsurpassed rain forests, hot springs, spectacular waterfalls, other scenic wonders, and new recreational facilities.

Several areas of historic interest were added to the Federal park system. Tuzigoot National Monument, in Arizona, contains prehistoric ruins of great archeological interest and unusual educational value. Chalmette National Historical Park, La., site of the Battle of New Orleans in the War of 1812, absorbed the Chalmette Monument and Grounds Reservation established in 1907. Appomattox, Va., scene of Lee's surrender in the War between the States,

became the Appomattox Court House National Monument. The Custer Battlefield National Cemetery, S. Dak., was transferred to the Federal park system by Executive order of June 3, 1940, the transfer to take place on July 1. Under the Historic Sites Act the Manassas National Battlefield Park in Virginia and the Vanderbilt Mansion at Hyde Park, N. Y., were designated national historic sites. The latter preserves a magnificent example of the type of great estates built by captains of industry in the era that succeeded the War between the States.

Abraham Lincoln's birthplace, in Kentucky, formerly classified as a national park, was designated the Abraham Lincoln National Historical Park, and Fort McHenry National Park in Maryland was given the more appropriate status of national monument and shrine.

Establishment of new park areas and changes in boundaries brought the total number of units in the Federal park system to 161, with a total area of 21,550,783 acres.

A total of 15,454,367 persons visited the Federal park areas during the travel year ended September 30, 1939. Through June 30, 1940, the travel for the year beginning last October 1 was approximately 500,000 ahead of the same period a year ago. Winter sport activities increased in popular favor, with resultant increase in the winter visitation.

Preservation of historic Cumberland Gap, in Virginia, Kentucky, and Tennessee, was authorized by Congress, with the proviso that the lands within the approved boundaries be donated to the United States. This has been the basis of practically all recent park establishment involving areas wholly or partially privately owned.

Excellent progress is being made on the Blue Ridge Parkway, with the prospect of more than 300 miles of scenic roadway, free of billboards and roadside stands to be completed or under construction during the 1940 season. Opening of the tourist season this spring found a continuous stretch of 140 miles between Adney Gap, Va., and the North Carolina State line opened to use for the first time. Another stretch of 50 miles between Grandfather Mountain and Mount Mitchell, both in the North Carolina section of the parkway, was opened on a "travel at your own risk" basis. Invitations to bid for concessions to operate motor service and eating facilities on the Blue Ridge Parkway were issued.

Three sections of the Natchez Trace Parkway, totaling 36 miles in Mississippi, were graded and surfaced. Another section of 11 miles in that State was graded and 29 additional miles were under construction at the close of the year. In Tennessee 9 miles are under

construction. Survey and location work was carried on in Alabama, Mississippi, and Tennessee.

Shenandoah's Skyline Drive, which is an integral part of the greater parkway connecting and passing through Shenandoah and Great Smoky Mountains National Parks, was completed and opened to travel.

In view of the dissimilarity between the National Capital Parks system and other park systems throughout the country, both national and municipal, the Secretary of the Interior requested that a joint study of the park system of the District of Columbia be made by Capt. Charles G. Sauers, general superintendent of the Cook County Forest Preserve of Illinois, and Mr. H. S. Wagner, director-secretary of the Akron Metropolitan Park District, Ohio. Following submission of their report, a civil-service examination was held to develop a register of eligibles for the position of superintendent of the National Capital Parks.

Wildlife research activities of the National Park Service on January 1 were transferred to the Bureau of Biological Survey, which immediately reassigned the personnel engaged thereon to National Park Service duties. Improvement of wildlife range conditions continued to be the chief wildlife management activity in the Federal park system.

A training school in recreational leadership, similar to the Yosemite School of Field Natural History, was inaugurated at Swift Creek Recreational Demonstration Area, Virginia.

A P. W. A. project permitted continuation of the Historic American Buildings Survey, through which the Service is helping to preserve the plans and photographs of structures that played a significant part in our historic past, or that are of importance in denoting a particular phase of the country's architectural development. A small staff working from four strategically located cities provided the most workable organization yet assembled for carrying on the survey.

Engineering research resulted in the development of a new type of radio antenna for park ranger patrol cars which created nationwide interest, especially among Federal and State agencies, many of which desire to take advantage of the results. Work now in process promises development of a compact, ultra-high-frequency radio field set which bids fair to surpass anything heretofore available in this line.

Airplane patrols supplemented the customary dog-sled method in Mount McKinley National Park, Alaska, making it possible to cover in 3½ hours territory that would require 4 weeks to patrol by dog team.

The fire-protection statistics accumulated during the past 10 years proved of value in facilitating improved protection, and new fire lookouts improved the forest-fire detection systems.

Advance of the white-pine blister rust to the sugar-pine forests of California has created a formidable problem. Control activities have been planned by the various agencies involved, but sufficient funds to make them effective are not available. At present this problem ranks next in importance to fire in forest protection in the national parks.

Public interest in all phases of national parks resulted in an all-time high in informational work through every recognized channel—radio, press, and magazine publicity, information circulars, lectures, picture distribution, and extension service. The free fall and winter lecture service was given to capacity audiences, frequently with an overflow of several hundred disappointed persons. The monthly series of articles on the four-hundredth anniversary of Coronado received world-wide distribution through several media.

Passage of the act to establish the United States Travel Bureau was assured as the fiscal year came to a close. Passed by both Houses of Congress, it awaited Presidential approval (which was affixed July 10). The Bureau further consolidated its position as the coordinating agency for public and private organizations concerned with the development of recreational travel. Pending appropriation of the authorized funds, it continued to operate under emergency financing.

With a quota of 310 continental C. C. C. camps, the Service continued its broad program of conservation and recreation development on 90 national parks and monuments, 22 recreational demonstration areas, and 198 State, county, and metropolitan parks. Camps were established for the first time in the Badlands (S. Dak.) and Chaco Canyon (N. Mex.) National Monuments, Saratoga (N. Y.) National Historical Park project, and Kings Canyon (Calif.) National Park. C. C. C. camps in Hawaii and the Virgin Islands, authorized for 675 enrollees on 5 projects, operated solely under the jurisdiction of the National Park Service.

The Service is cooperating with the Philippine Commonwealth and the Territory of Hawaii by detailing park planners to make studies of national park possibilities on those islands. Following a study of the national parks of the United States by a committee of officials from the Philippines and a request from President Quezon, the National Park Service detailed Louis P. Croft to the islands as adviser on national parks. He will assist in the survey of park possibilities and draft plans for improvement of existing parks. Merel Sager was detailed for 6 months to assist the Territorial Planning

Board, Territory of Hawaii, in the study of potential recreational areas and activities.

In cooperation with the Reclamation Service and the Lower Colorado River Authority, and financed with P. W. A. funds, a comprehensive study was begun on recreational possibilities along the impounded waters of the Colorado River, Tex.

The work of the Safety Committee of the Service in the preparation of safe practice standards and of the safety committees organized in the Federal parks has been effective in reducing compensation costs. From 1936 to 1938 the reduction in such costs was 45.7 percent. Preliminary figures of the United States Employees' Compensation Commission for 1939 indicate a further substantial reduction in compensation payments for injuries.

The National Park Service continued its participation in the leadership of the Federal Interdepartmental Safety Council through representation on the Executive Committee of the Council.

Field studies were accomplished in many of the parks on telephone, electric, and water services furnished by the Government. These cover the planning for new telephone systems and the recommending of improvements in existing systems; operation studies of electric and water systems for determination of rates to be charged for services and recommended improvements.

"A Study of the National Recreation Problem," the first Nation-wide report on the Park, Parkway, and Recreational Area Study, was completed during the year. In addition, State reports were completed in Arkansas, Florida, Maine, Massachusetts, New Mexico, Texas, Rhode Island, and Washington, making a total of 30 State reports completed to date. Special reports on organized camping were prepared for California, Georgia, Ohio, and South Carolina. Bills authorizing a survey to determine a suitable route for a national Mississippi River Parkway were introduced in both Houses of Congress last year and are still pending; meanwhile, legislation has been enacted in Arkansas, Illinois, Kentucky, Mississippi, Missouri, and Wisconsin enabling these States to cooperate with the Federal Government in the planning of such a parkway.

Amicable State relationships were continued and the administrative machinery of a number of States strengthened as a result of Service suggestions for careful, regularly revised master planning, and proper protection and maintenance of areas developed with C. C. C. funds.

Under a cooperative agreement with Work Projects Administration, the Service continued its review of applications submitted to the W. P. A. for work on park and recreation areas.

The subject of fee charges by the Federal Government in various park areas was studied and new fees subsequently established.

A Nation-wide study was made of fees and charges for public recreation services in park areas of various types throughout the country and report thereon made to the American Institute of Park Executives.

The trust fund administered by the Service's trust fund board now amounts to \$14,817.05. Annual interest on investments increased the fund in 1940 by \$343.56.

A conference of national park superintendents and other ranking administrative field officers, with key officials of the Washington office staff, was held in Santa Fe, N. Mex., October 2 to 9, 1939. Among the subjects discussed were studies of adjustments in field and park organizations and personnel necessary to keep abreast of the rapid expansion of the Service; an analysis of the broad field of fees and revenues; accommodations for the public with especial reference to lower-priced cabin and housekeeping types of service; youth hostels and their adaptability to the National Park Service recreational program; and a review of interpretive programs designed to aid in visitor enjoyment.

The operators of concessions furnishing accommodations for visitors to the national parks met in Washington in November 1939. These meetings are held periodically to insure close collaboration with the Service in maintaining high standards of service. Other conferences held in Washington were those of the regional directors, the regional engineers, and regional foresters, all in February 1940; and in the same month a meeting of Southwestern National Monuments custodians at Casa Grande National Monument, Ariz., headquarters of the Southwestern group.

These conferences provide excellent media for inculcation of park ideals in newer members of the Service and for that exchange of ideas and explanation of policies so essential to the morale and smooth functioning of a farflung organization.

With deep sorrow is recorded the death of Frank Pinkley, Superintendent of Southwestern National Monuments, last February.

REGIONALIZATION INCREASINGLY EFFECTIVE

Each year the effectiveness of the regionalization program becomes more apparent. The four regional offices, as liaison agencies between the park areas and the Washington Office, assisted actively in developmental, planning, and investigational enterprises in connection with Federal parks and State, county, and metropolitan areas. Activities on non-Federal areas resulted in Service cooperation with practically each State in the Union. Comprehensive land-use planning was furthered by Service participation, through the regional offices, in drain-

age basin activities, and the preparation of land analyses of the Park, Parkway, and Recreational Area Study.

Consultation service was rendered Federal and State agencies and private associations in various phases of park and recreational work, including treatment and interpretation of historic sites and assistance given non-Federal agencies in the initiation of leadership programs. Through their contacts with outdoor clubs, conservation organizations, State officials, and allied groups, the regions kept the Service conversant with developments and trends in the field of parks, recreation, and conservation generally.

UNITED STATES TRAVEL BUREAU APPROVED BY CONGRESS

As the fiscal year came to a close, passage was assured of H. R. 6884, "To encourage travel within the United States," as the bill had then passed both Houses of Congress. The President approved the act on July 19, 1940. Thus, for the first time since its establishment in 1937, permanent existence of the Bureau was assured and long-range planning made practicable. Estimates of appropriations required to carry on the work of the Bureau during 1941 under this congressional authority have been forwarded to the Bureau of the Budget. Meanwhile financing was continued under emergency appropriations.

Throughout the year the Travel Bureau further consolidated its position as the coordinating agency for public and private organizations concerned with the development of recreational travel. The program touched increasingly on all aspects of the travel situation, including its development, its promotion, its significance, and the intricate problems involved in its handling.

An example of the Bureau's value as a coordinating agency was provided by President Roosevelt's proclamation declaring 1940 to be Travel America Year. The proclamation was instigated by the Bureau and used by the travel industry as the spearhead of a great Travel America movement.

A 5-year tabulation of the retail expenditures of recreational travelers in the United States was completed, revealing that they rose 26 percent from 1935 to 1939 and total the enormous sum of \$26,000,000,000 for the 5-year period.

The monthly Official Bulletin of the Travel Bureau now goes out to a request list of almost 7,500 individuals and organizations who have come to regard it as the authoritative source of basic information and data on developments within the industry. Another informational service was added—the semiannual calendar of events, listing the nature and date of events of interest to tourists through-

out the country. A directory of Negro hotels was compiled and facilities were arranged with transportation and accommodation services throughout the country for the convenience of Negro travelers. A descriptive poster list was published showing the number and variety of display posters available for use by various groups in travel displays.

The Bureau has consistently stressed the safety, the value, and the need for greater inter-American travel. This has played an important part in the greatly expanded travel between the American continents. Plans were laid during the year to increase this kind of work.

THE PARK, PARKWAY, AND RECREATIONAL AREA STUDY

The Nation-wide Park, Parkway, and Recreational Area Study being conducted by the Service in cooperation with the States is proceeding with the planned program as a continuing activity.

Reports on State-wide recreation plans and programs have been prepared in Arkansas, Florida, Maine, Massachusetts, New Mexico, Texas, Rhode Island, and Washington, making a total of 30 State reports completed to date. Work has been continued on other phases of the Recreation Study, including the investigation and appraisal of existing and potential areas, the study of recreational resources and such special activities as organized camping, leading toward the formulation of more complete and comprehensive programs. Reports on organized camping have been prepared in California, Georgia, Ohio, and South Carolina.

The Service's first Nation-wide report, A Study of the National Recreation Problem, is now being published at the Government Printing Office. This report is based to a considerable extent upon the information collected through the State studies, and will furnish the framework for a coordinated and unified national recreational plan.

An important outgrowth of the recreation study is the coordinated effort of the States along the Mississippi River in the planning for a national parkway following the general course of the River from its source in Minnesota to the Gulf of Mexico. Arkansas, Illinois, Kentucky, Mississippi, Missouri, and Wisconsin have enacted legislation enabling them to cooperate with the Federal Government in the planning and development of such a parkway. The Iowa and Minnesota Legislatures have passed resolutions endorsing the project. Bills authorizing a survey to determine a suitable route for a national Mississippi River Parkway were introduced in both Houses of Congress last year and are still pending.

STATE RELATIONSHIPS

The National Park Service continued its relationship with the States and many political subdivisions, principally through its joint participation with them in supervision of Civilian Conservation Corps work on their park and recreation areas. Increasingly the States which have recently entered the park field are assuming responsibilities which are rightfully theirs, chiefly by a greater degree of participation in planning and by contributions to the costs of adequate development, no longer feasible with C. C. C. funds alone in areas where remaining work is largely of construction character.

These non-Federal agencies have been helped materially by the Service's suggestions for careful and regularly revised master planning of their properties and by the searching review accorded their plans by Service technicians. At the same time, insistence that areas developed by C. C. C. funds be properly protected and maintained has been an influence in strengthening their administrative machinery. Since continuance of Federal assistance is conditioned on such protection and maintenance, field representatives frequently view and report on the manner in which it is provided.

Though inadequately staffed for the purpose, the Service, under a cooperative agreement with W. P. A., reviewed and advised on approximately \$100,000,000 worth of park and recreation applications submitted to W. P. A. during the past year.

USE AND DEVELOPMENT OF HISTORIC AREAS

Conservation of the historical areas is an obligation of the National Park Service which assumes increased significance in the present necessity for national defense. This theme is vividly dramatized at such areas as the Statue of Liberty, New York Harbor, Colonial National Historical Park, Va., the Saratoga National Historical Park Project, N. Y., and Fort McHenry National Monument and Historic Shrine, Md. An attendance of 7,000,000 at our national historical parks and monuments, recruited from the 48 States and many foreign lands, was accompanied by interpretations by ranger historians of the part these areas played in the American way of life, and the place accorded them by historians and military experts.

Saratoga National Historical Park Project, New York, turning point of the American Revolution, is now being developed, through Civilian Conservation Corps cooperation, in a manner commensurate with its far-reaching importance.

The Statue of Liberty National Monument, in New York Harbor, was visited by 428,000 people.

Intensified interpretive programs at Colonial National Historical Park, Va., and Morristown National Historical Park, N. J., strike the keynote that makes every visitor conscious of America's rich heritage. Similar inspiration attended the special celebration held at Fort McHenry National Monument and Historic Shrine, Md., birthplace of the Star Spangled Banner.

Pan-American interest has been focused on the Southwest, where the National Park Service has been cooperating with the Coronado Cuarto Centennial Commission in celebrating the four-hundredth anniversary of Coronado's explorations. An international monument has been proposed at the approximate location where Coronado entered what is now the United States. In the Southeast a Pan-American center has been considered by the city of St. Augustine, Fla., and the cooperation of the Carnegie Institution and the National Park Service has been solicited in the development of this center.

Perry's Victory and International Peace Memorial, Ohio, which commemorates Perry's victory in the battle of Lake Erie, on September 10, 1813, and more than 120 years of peace and friendship between Canada and the United States, was reopened to the public upon completion of repairs to the elevator.

At the Statue of Liberty National Monument, the unsightly red brick barracks buildings have been demolished through the aid of the W. P. A. With P. W. A. funds an administration building of grey stone, harmonizing with the statue itself, is being erected. Plans for the landscaping of the area have been completed.

At Morristown National Historical Park, N. J., where the flicker of liberty was kept burning by Washington and his troops during the bitterly cold winter of 1779-80, the Ford Mansion occupied by Washington has been rehabilitated. The rotted beams in the ceilings and walls have been replaced with solid timbers. Modern floors have been replaced by floors simulating the original flooring. The house is being furnished as of the period when General and Mrs. Washington made this building their home.

At Salem Maritime National Historic Site, Mass., where the historical interest centers on early United States shipping, the reconstruction of Derby Wharf and Central Wharf has been completed. The Derby House, once the home of the well-known merchant, Elias Hasket Derby, owner of the *Grand Turk* and other famous American ships, was repainted.

At Homestead National Monument, Nebr., which commemorates a significant chapter in Federal land policy and American westward expansion, native grasses and shrubs were planted to give the area an appearance similar to that which it possessed when Daniel

Freeman during the early hours of January 1, 1863, filed the first claim made under the homestead law.

At Fort Laramie National Monument, Wyo., the historic officers' quarters known as Old Bedlam were reroofed and the porch restored. The cavalry building was resingled, and to prevent further deterioration of the Sutler's Store, stabilization of its foundation was undertaken. This area, located on one of the main traveled routes to the Northwest, played an important role during the fur-trading era and the Oregon migration.

Notable progress was made in archeological work. At Jamestown, Va., the foundation of one of the earliest brick structures in the United States was excavated and a large part of the seventeenth century shore line of the island was determined. At Ocmulgee National Monument, Ga., two units of the museum building were completed to house and display the extensive collection of Southeast artifacts excavated during the period 1933-39.

To preserve the homes of prehistoric Indians in the Southwest, important ruin stabilization projects were undertaken at Chaco Canyon National Monument, N. Mex., Inscription House in Navajo National Monument, Ariz., Bandelier, N. Mex., Aztec Ruins, N. Mex., and Walnut Canyon, Ariz., National Monuments. Some of this work was undertaken by an Indian C. C. C. mobile unit consisting of Navajo enrollees under the direction of a competent archeologist.

Significant progress was made in the development of Hopewell Village, National Historic Site, Pa., which commemorates an important phase of industrial development in this country; namely, iron manufacturing. The walls of the old blast furnace at this area have been stabilized. The mill race, supplying water to operate the waterwheel at the furnace, has been traced by archeological investigation.

At the Saratoga National Historical Park Project, N. Y., where the English under Burgoyne were defeated by the Americans under General Gates, and which proved to be the turning point in the American Revolution, a C. C. C. camp has been actively engaged in the removal of nonhistoric features, such as modern fences and farm buildings.

The National Park Service and the C. C. C. cooperated in developing the following State park areas which are historical or archeological in character: Fort Morgan State Park, Ala.; Fort Clinch State Park, Fla.; Mound State Park, Ala.; New Salem State Park, Ill.; Illinois and Michigan Canal State Park, Ill.; Custer State Park, S. Dak.; De Mores State Park, N. Dak.; University Ruin, Tucson, Ariz.; Goliad State Park, Tex.; La Purisima State Historical Monument, Calif.; San Juan Baptista State Historical Monument, Calif.; Shelby Negro State Park, Tenn.; Fort Griffin State Park, Tex.

HISTORIC AND ARCHEOLOGIC SITES SURVEY

The Nation-wide Historic Sites Survey is proceeding according to a chronological thematic program. Reports on seventeenth and eighteenth century French and Spanish sites, and Colonial Dutch and Swedish sites have been completed. In the field of archeology a preliminary report on Early Man in North America, a preliminary report on Prehistoric Sedentary Agricultural groups, and a final report on Historic Sedentary Agricultural groups were prepared. The prehistoric and historic sedentary agricultural groups include many large and spectacular sites belonging to the mound builder and pueblo type civilizations. This class of remains suffers most from relic hunters and the elements and therefore has received primary consideration.

The Historic Sites Survey is laying the basis for a broadened concept and keener understanding of this country's past. The establishment of a classified list of significant sites will focus the attention of individuals, organizations, and Federal and State agencies in preserving and using them.

The National Park Service has worked cooperatively on a survey of archeological areas with Harvard, Columbia, Michigan, Louisiana, Tennessee, Alabama, and Georgia Universities.

HISTORIC AMERICAN BUILDINGS SURVEY

Pursuing the national plan sponsored by the Department of the Interior, through a three-party agreement between the National Park Service, the Library of Congress, and the American Institute of Architects, the Historic American Buildings Survey added substantially to the permanent graphic record of noteworthy examples of architecture erected in the United States and possessions prior to the last quarter of the nineteenth century. A unit was established in Washington to coordinate both Federal and State measuring groups. Four field units were established to work out of Boston, Richmond, St. Louis, and Santa Fe.

The Survey succeeded in recording by emergency surveys a number of valuable structures threatened with destruction. Supervisory cooperation with a number of State W.P.A. recording projects was continued.

The Historic American Buildings Survey Collection in the Fine Arts Division of the Library of Congress included more than 18,600 measured drawings and 20,200 architectural photographs, which are in frequent use by architects, archeologists, historians, students, and libraries.

MEMORIALS

Jefferson National Expansion Memorial, St. Louis, Mo.—By June 30, 1940, negotiations were completed for acquiring 397 of the 483 separate parcels of real estate comprising the area of this memorial, at an aggregate cost of \$4,656,318. Of these, 390 parcels were acquired through negotiations and agreements with the owners and 7 parcels were acquired through condemnation. The amounts paid totaled \$471,396 less than the aggregate awards of the Court Commissioners appointed by the Federal court to report on values of these properties.

On July 1, 1940, agreements covering 86 parcels of land remained to be reached, on which the aggregate of awards by the Court Commissioners is \$1,894,945, and the amount paid into the court with the Declarations of Taking is \$1,638,474.

When title to the area became vested in the United States there were 203 occupied buildings to be evacuated. By January 1, 1940, only 116 buildings remained occupied. On June 30, only one property remained occupied, and the owner of that, a large manufacturing company, had a new plant well along in construction. At the close of the fiscal year, wrecking operations were 40 percent completed.

Mount Rushmore National Memorial, S. Dak.—Under the President's Second Reorganization Plan the Mount Rushmore National Memorial was again placed under the administration of the National Park Service. Following inspection of the area around the memorial, preliminary plans were made for a permanent administrative and operating establishment to be maintained by the National Park Service when the memorial carving has been completed.

The National Park Service cooperated with the Mount Rushmore National Memorial Commission in preparation of a map showing the boundaries of the 1,500-acre tract established by act of Congress, approved June 15, 1938, as the memorial area. This was increased to 1,800 acres by the act of May 22, 1940, and the Service has initiated steps looking to the preparation of a map covering this larger area.

Thomas Jefferson Memorial, Washington, D. C.—At the close of the fiscal year the walls of Washington's Thomas Jefferson Memorial were practically finished and 45 of the total of 54 columns were in place. The erection of the dome also was well under way and the memorial as a whole about 66 percent completed.

Mr. Lee Lawrie was selected in the competition held by the Thomas Jefferson Memorial Commission to carve the figure of Thomas Jefferson to be placed in the memorial.

INTERPRETIVE SERVICE AND SCIENTIFIC RESEARCH

The National Park Service is so advantageously situated in the Federal scheme of conservation and public education that it plays a vital part in stabilizing the thinking of the American citizen. The bulwark of strength in preserving national traditions rests in the intelligence and appreciative understanding of the American citizen. Some 16 million of those American citizens visited the national park areas of the United States in the 1939 travel year. Undoubtedly, the number will be greater this year.

Public appreciation of things American was promoted in the scenic national parks and monuments through the interpretational facilities offered by 34 park naturalists and 107 ranger-naturalists employed on a seasonal basis. The naturalists are supported by a corps of specialists in the various branches of the natural sciences and receive the cooperation of a staff of exhibit designers and preparators who fabricate the exhibits which are an important part of the interpretational program. Other visual aids consist of motion and still pictures of park features which have been made in natural color.

Through radio programs broadcast from eight stations, naturalists interested the public in the cause of conservation. Two of the programs were directed toward juvenile education. In Rocky Mountain National Park, Colo., the naturalist conducted a group of school children on the trails and by means of a traveling microphone broadcast over a national network the story of the park and a quiz of the children. Another program was instituted in the National Capital Parks, District of Columbia, where selected children were taken on nature walks prior to their schoolroom broadcasts in which they were questioned regarding their experiences on the trail.

NATURALIST TRAINING

In order to insure a supply of trained personnel for the seasonal staff and to assist those who wish to qualify for permanent positions, the training programs of the Yosemite School of Field Natural History and the Yosemite Junior Nature School were continued. Both are nonprofit organizations, the former requiring a college degree as entrance prerequisite and the latter admitting children. A training school in recreational leadership was also inaugurated in the East at Swift Creek Recreational Demonstration Area near Richmond, Va. Here the work is directed by recreational specialists with scientists cooperating in offering instruction. These schools opened the 1940 season under promise of success.

Yale University again granted two graduate fellowships to Service employees, affording an opportunity to the recipients to pursue courses of study designed to make their services in the parks more valuable.

PROGRESS IN RESEARCH

Much was accomplished in research in the biological and geological fields. In the former the emphasis was placed on studies to maintain the natural balance between species both of plants and animals. The most pressing have been concerned with the wolf-sheep-caribou relations in Alaska, the bighorn-burro relations in Death Valley, Calif., and the coyote problem in several areas. Of equal importance, although of less spectacular nature, are the censuses of wildlife which are made seasonally. In virtually all of the areas having naturalist services there is a consistent effort to add to the herbaria of the park and to complete the faunal and geological collections which serve as study and reference material for both the visitors and the park staff.

Geological research for interpretive purposes has been varied. Observations were made on the following long-term projects: the annual glacier measurements to determine the changes in the ice caps in the western mountains; the thermal observations at Yellowstone which throw light on the behavior of the geysers; the earth-tremor recordings at Lassen, Volcanic, and Hawaii National Parks, which are useful in interpreting volcanic activity, and at Boulder Dam, Nev., for the purpose of appraising the adjustment of the rocks to the increasing weight of Lake Mead.

A spectacular culmination of the recording of microscopic earth movements and other volcanic phenomena was furnished by the eruption of Mauna Loa in Hawaii National Park. The eruption had been forecast by Dr. Jaggar for several years, as a result of his studies in the Hawaii Volcanic Laboratory, the warnings becoming more specific as the indications became more diagnostic. The activity of the volcano has been closely observed, gases have been collected, and its performance correlated with past records.

The use of the parks by schools and colleges to supplement winter term courses in the natural sciences is again worthy of notice, 89 study and research groups having visited these areas.

Much scientific and informative material was recorded in the technical reports of the staff. A number of these were printed in scientific or organization journals, others appeared as publications of the Natural History Associations, and still others are awaiting funds for printing.

CONSERVATION IN PARK DEVELOPMENT

A noteworthy conservation effort was initiated at Platt National Park, Okla. This park is situated in an artesian basin which has been notable from prehistoric times for the qualities of its mineral water, among them the only known bromide springs. A study showed that unrestricted flow from wells drilled nearby for therapeutic or exhibition uses has resulted in a loss of 80 percent of the natural flow. The Service has sponsored cooperative action on the part of local developers outside the park to conserve the water so it will be permanently available.

The core drill has been active in Region 1 in developing water for Federal and State parks and forests. Areas were studied, locations chosen, and 18 successful wells developed. The drill was used also to test dam sites, obtain soil samples for scientific study, and to grout dam foundations in 5 additional projects.

Pursuant to the Service policy of excluding areas from park and monument boundaries in which mineral deposits of economic value occur, investigations were made of six areas. Boundary adjustments or special regulations were proposed in those cases where a conflict between economic and recreational interests might develop. Many other developmental activities were aided through the advice of staff scientists on the technical aspects of the planning and accomplishment of these projects.

MUSEUMS

The Service's visual education activities were conducted during the year in more than 100 museums, where the recorded visitation numbered nearly four million, and some 25 trailside exhibits.

Museum planning for the Jefferson National Expansion Memorial in St. Louis, Mo., was the largest single activity of the year. Intensive studies were completed for approximately two-thirds of the major divisions of the national expansion story. Reports on the Role of the Indian in National Expansion and A Preliminary Bibliography on the American Fur Trade were mimeographed to facilitate curatorial work. In addition, specific information was gathered for current use in the museum laboratory. During the year the laboratory continued to produce exhibits to be installed in a temporary museum on the memorial site. Among those now in process of preparation is a scale model of the basic museum facilities desired for the memorial.

A complete museum installation was made during the year in the new adobe building at White Sands National Monument, N. Mex. The exhibits relate chiefly to the geology and ecology of the gypsum dunes of the vicinity and also touch upon local ethnology and history.

Archeological interests in southeastern United States centered around Ocmulgee National Monument near Macon, Ga., where plans were completed for a museum to interpret the ancient Indian civilizations which flourished in that vicinity prior to the advent of the white man and in early historic times as revealed by the prehistoric mounds, elaborate fortification system, ceremonial earth lodge, cultivated field, ancient trading post, and burial mounds located on the area. A modern building is now under construction to house the museum exhibits.

Exhibit plans were approved for four museums; general museum development plans were approved for two areas; and several additional development plans were completed and are ready for review and approval.

Existing exhibits in more than 20 museums were either revised or increased. The Western Museum Laboratories also distributed among the parks an array of miscellaneous products designed to aid the park interpretive work. Among the major items were some 3,500 reprint holders; 5,000 pamphlet binders; 16 herbarium, geology, study skin, and insect cases; 5 museum cases; 3,800 silk screen posters; 2,449 metal trail labels.

Dioramas, paintings, models, and photographs were displayed at 12 fairs, conventions, and expositions. A large number of exhibits were also supplied to the United States Travel Bureau for display at similar assemblages throughout the United States.

WILDLIFE STUDIES

Wildlife research on areas in the national park system during the past fiscal year was performed by two agencies. Prior to January 1, 1940, it was undertaken by the National Park Service through its Wildlife Division of the Branch of Research and Information. After that date, at the direction of the Secretary of the Interior, all wildlife research was transferred to the Bureau of Biological Survey, which reassigned the entire staff to National Park Service duties and set it up as a Section on National Park Wildlife in the Division of Wildlife Research. The work of the Section is integrated with the broad program of the National Park Service through the Branch of Research and Information of that bureau. In the following report, all research is reported without segregation, since practically all projects continued throughout the year, and the transfer involved no change of policy.

Prey-predator ecology continued to be the major research project. Field work is now centered upon the wolf-sheep problem in Mount McKinley National Park, Alaska.

In October 1939, a closer coordination between all research agencies working on bighorn in the Rocky Mountains was effected through an agreement between the National Park Service, the Bureau of Biological Survey, the Forest Service, and the States concerned. A consequent improvement in assembling and distributing data results in more efficient efforts to conserve this endangered species. The National Park Service contribution to this cooperation has come from Rocky Mountain National Park, Colo., where studies on dietary and mineral requirements of bighorn are in progress; from Yellowstone National Park, Wyo., where migration and range are being studied by the naturalist staff; and from Glacier National Park, Mont., where the Regional Biologist and park staff are studying lambing range requirements and improvement. Inventories in Death Valley National Monument, Calif., show a gradual improvement in the status of Nelson bighorn, but indicate a need for elimination of feral burros. Similar range competition is found to be imminent at Boulder Dam National Recreational Area, Nev. Studies in Organ Pipe Cactus National Monument, Ariz., show that distribution of water holes may be the present limiting factor in conservation there of the Gaillard bighorn.

Other inventories include a survey of the botanical resources of Mount McKinley National Park, Alaska, through cooperation of the Universities of Wyoming and Alaska; a preliminary survey of wildlife at the new Channel Islands National Monument; and similar work at Capitol Reef, Utah, and Joshua Tree, Calif., National Monuments.

Additional research projects included a study of mosquito control methods in the southeastern United States, resulting in recommendation of pyrethrum as a deterrent, rather than fuel oil; studies of reported overpopulations of deer at Hickory Run Recreational Demonstration Area, Pa.; and of deer, turkeys, and raccoon at Colonial National Historical Park, Va.; appraisal of wildlife habitats along the Blue Ridge Parkway; study of mixed-type habitats versus solid forests in southeastern areas; continuance of the Yellowstone trumpeter swan studies; and study in Rocky Mountain National Park of forage utilization by elk, deer, bighorn, and beaver.

During the past year improvements in making and recording the annual wildlife inventories in the various parks have made such data more usable in various management and publicity projects.

WILDLIFE MANAGEMENT

Improvement of range conditions through regulation of large herbivorous species and through reductions in grazing of domestic stock has continued to be the chief wildlife management activity in the national park system. In Wind Cave, S. Dak., and Platt, Okla.,

National Parks the buffalo herds were reduced, chiefly through disposal to Indians, to the carrying capacities of the respective ranges. At Wind Cave efforts are also being made to effect some reduction in the elk herd of 130 head by transfer to the adjacent State game preserve.

Grazing conditions at Olympic National Park, Wash., were improved by a herd reduction of about 500 elk, legally killed from among those migrating outside the park. A similar method of reduction was last fall authorized east of Rocky Mountain National Park; and tentative arrangements have been made with the Montana Game Commission to adopt such a practice with surplus elk that annually move outside Glacier National Park. The Yellowstone elk reduction program was practically suspended this year by a very mild winter, but fortunately for the range the same climatic condition permitted most of the elk to remain above the winter range, and favored good growth of vegetation to counteract the slight herd reduction of but 122, legally killed outside the park, and 16 live-shipped for restocking.

Improvement in ranges overstocked with deer continued satisfactorily. In Zion National Park, Utah, a shipment of 62 animals to understocked areas elsewhere resulted in marked improvement of both range and deer inside the park. In Pennsylvania areas overbrowsing will be corrected or prevented by a recent agreement, approved by the Secretary of the Interior, whereby the National Park Service and the Pennsylvania Game Commission will cooperate on regulated hunting in such recreational demonstration areas in that State as require management measures to preserve recreational values. Overabundance of deer in Colonial National Historical Park is being corrected by cooperation with the State of Virginia to the end that surplus animals will be trapped and planted in understocked parts of that State.

THE REDUCTION OF GRAZING BY DOMESTIC STOCK

Notable progress has been made in several national parks and monuments. Through an agreement between the National Park Service and the Grazing Service, approved by the Secretary on February 20, 1940, grazing privileges at the Carlsbad (N. Mex.) Caverns National Park addition; Grand Canyon (Ariz.) and Zion National Monuments; and Dinosaur (Utah) National Monument addition are being expeditiously handled by field men of both Services on a basis of gradual reduction and eventual elimination of grazing. Areas adjacent to forest reserves, such as Bryce Canyon (Utah) and Kings Canyon (Calif.) National Parks, are receiving similar "tapering off" management by the National Park Service. Other grazing projects include eventual removal of saddle horses from a bighorn lambing ground in Glacier National Park; removal of stray cattle and

burros from important bighorn ranges in Death Valley National Monument; and improvement of waterholes for antelope at White Sands (N. Mex.) National Monument.

The perennial bear-visitor problem became less acute during the past year, as educational work was increased at campfire lectures, on guided trips, by radio, public press, and posters. Through all these media the public may be eventually more appreciative of bears in natural surroundings, in contrast to the "bear shows," and more cooperative in following the recently strengthened regulations against feeding or molesting the bears. In addition, the park officials have been increasingly vigilant in the prompt elimination of dangerous bears. Steps have also been taken to minimize one of the two remaining bear shows that are still conducted in the parks. As a result of these efforts there has been a definite drop in the number of bear injuries.

Other management projects include mosquito control on Service areas in the southeast; porcupine control in a restricted public-use area at Black Canyon of the Gunnison (Colo.) National Monument; and boundary adjustments between Lava Beds (Calif.) National Monument and Tule Lake Migratory Waterfowl Refuge to permit more effective administration of both.

FISH CONSERVATION

The principal activities in this field were transferred by direction of the Secretary of the Interior to the Bureau of Fisheries at the same time wildlife research was transferred to the Bureau of Biological Survey. As of June 30, 1940, the President's Reorganization Plan No. 4 placed both these activities in the one bureau, designated as the Fish and Wildlife Service. Following the first action, the new hatchery at Glacier National Park was shifted to the Bureau of Fisheries, and a working agreement for fisheries in all park areas was approved by the Secretary of the Interior on June 7, 1940. Hatchery and research activities will be the function of the Bureau of Fisheries, while planting, law enforcement, and policy recommendation remain with the National Park Service.

Heavy fish plantings, in accordance with scientific plans, continued this year to assure maintenance of the national park standard for excellent fishing. Over 14,000,000 trout and grayling will be planted in Yellowstone alone during 1940. Hatching and rearing facilities have been improved at Sequoia and Glacier National Parks, and improvements in egg-collecting stations were made at Yosemite and Yellowstone. Great care was given in all park areas to the drafting of regulations conducive to maximum conservation. Special attention

was given to many other problems, including further cooperation with State fish commissions at Boulder Dam, at Olympic, and in many small eastern areas; study of a *saprolygnia* infection on silver salmon in Crater Lake; stream improvement to correct damage by road construction in Great Smoky Mountains National Park; and studies upon which to base improved fishing in numerous State parks and recreational demonstration areas.

INFORMATION SERVICE

Information concerning the National Park Service and its activities was disseminated to a world-wide audience through various accepted media of distribution, including the press, radio, illustrated lectures, printed and processed literature, and picture service. In addition to prepared statements to the press on matters of current interest, material was furnished upon request to newspaper and magazine feature writers, and several monthly services on specialized subjects were issued to selected groups indicating interest therein. Cooperation was also maintained with patriotic societies, civic and conservation organizations, study clubs, schools, and allied groups.

NEW PRINTING PROCEDURE FOR PARK LITERATURE

An innovation in the Service printing program was the authorization by the Congressional Joint Committee to print its circulars of general information commercially in the field. In the initiation of this program it was necessary to work out a plan of uniform procedure pertaining to printing and fiscal requirements. Through contracts awarded five printing firms in different sections, 1,902,000 booklets and folders were issued, ranging in editions from 22,000 to 200,000 copies for individual park areas. The inauguration of the field printing program proved highly successful, resulting in lessening both the time and cost of production of the publications.

In addition to this private printing, the series of informational bulletins on historic areas started last year was augmented by 16 new booklets. A new series of inexpensive sales publications, entitled the "National Park Service Popular Study Series," has been planned. This series, in popular style, will cover the subjects of archeology, history, and the natural sciences.

A number of miscellaneous publications, covering scientific and professional subjects, also popular types, including broadside folders and guides, are in process of printing.

Multilithed leaflets, numbering 805,000 and processed in the Department, were issued for many park areas for which no printed literature was available.

RADIO

The major work of the Service in radio during the year was the preparation of a new series of half-hour programs concerned with travel and titled "Two on a Trip." The 13 scripts in the series utilized a new approach and technique, merging narration, documentation, and dramatization; presenting scenic description, history, legend, adventure, and even travel costs for would-be travelers.

Stations requesting permission to broadcast the series included WNYC, the municipal station in New York City which claims 1,000,000 listeners; WILL, University of Illinois; WHA, University of Wisconsin; WGRC, Louisville, Ky; WIBA, Madison, Wis.; WLW, Cincinnati, Ohio; KWLC, Luther College, Decorah, Iowa; KWSC, State College of Washington, Pullman, Wash.; WMBC, Detroit, Mich.; KTSM, El Paso, Tex.; KBPS, Benson Polytechnic School, Portland, Oreg.; and WCOC, Meridian, Miss.

At the end of the fiscal year, WNYC had asked for an extension of the program, and plans were under way to produce at least six additional scripts. Transcriptions of the program are to be entered in the educational transcription contest to be held in Columbus, Ohio, next year. Scripts in this series are available to all independent radio stations throughout the country. A set of illustrated, multilithed travel tips, to be sent to "Two on a Trip" listeners, was also prepared.

Requests continue to come in from radio stations and particularly from schools for copies of the earlier 39-script series, "America's Hours of Destiny," for use on the air and in classrooms.

Cooperation was extended the Civilian Conservation Corps in preparing a radio script for use in Civilian Conservation Corps enrollment programs throughout the country.

LECTURES

The series of free midweekly illustrated lectures conducted from October to May in the Departmental Auditorium in Washington, D. C., reached new heights of listener interest. Capacity audiences were the rule, with hundreds of people frequently turned away. A total of 18 lectures was attended by 28,450 persons. Travel subjects and the popular sciences proved equally interesting to the audiences, which have registered an overwhelming request for continuation of the series next fall.

Assistance also was given during the year to placing cooperating lecturers of high standing on various civic and educational programs.

ENCYCLOPEDIAS AND ALMANACS

Each year an increasing number of the outstanding encyclopedias and almanacs request material on the national parks and Park Service activities generally for their annuals, in addition to periodic review of the main body of national park material in the encyclopedia proper.

CORONADO CUARTO CENTENNIAL COOPERATION

In consonance with the extension service plan inaugurated in 1938 with the widely acclaimed "Celebrated Conservationists" series, the National Park Service, in January 1939, inaugurated a program designed to instil interest in the early history of the Southwest and to promote sympathetic understanding between the United States and its Latin American neighbors. Observance of 1940 as the Coronado Cuarto Centennial made such a project timely and insured Nation-wide participation.

Historians and archeologists of the Service generously met the first year's request for the preparation of suitable articles. For the year beginning January 1940 articles were contributed by nationally and internationally known historians, among them Dr. Herbert Eugene Bolton, authority on Spanish-American history. "Our Own Spanish-American Citizens and the Southwest Which They Colonized" was the title given the 1939 series, which was planned to provide the background for the 1940 series, entitled "The Significance of the Coronado Cuarto Centennial." Distribution has been chiefly through educational systems, libraries, and State historical societies; although the press, travel agencies, and radio have utilized the series.

EXPANSION OF THE FEDERAL PARK SYSTEM

Excellent progress was made on the various proposals and projects to round out the Federal park system. Two national parks, three national monuments, and one national historic site were established; one national cemetery was added by Executive Order; one national park and two national monuments were enlarged; and legislation was enacted by the Congress authorizing establishment of one national historical park. The additions, with adjustments in boundaries of existing areas, increased the total acreage of the system from 20,817,228.14 acres as of June 30, 1939, to 21,550,782.55 acres on June 30, 1940.

As the year closed, the Federal park system included a total of 161 areas, as follows: Twenty-six national parks, 82 national monuments, 4 national historical parks, 11 national military parks, 7

national battlefield sites, 5 national historic sites, 1 national recreational area, 9 national memorials, 12 national cemeteries, 3 national parkways, and the National Capital Parks in the District of Columbia. While 2 national parks were added to the 27 in existence at the beginning of this fiscal year, the absorption of General Grant in the new Kings Canyon National Park and the redesignation of the Abraham Lincoln and Fort McHenry as national historical park and national monument and historic shrine, respectively, make their total 26.

National parks established.—Kings Canyon National Park, Calif., 454,600 acres, March 4, 1940 (General Grant National Park was abolished and became the General Grant Grove Section of Kings Canyon National Park); Isle Royale National Park, Mich., 133,405 acres, April 3, 1940.

National monuments established and other areas transferred to Service.—Tuzigoot National Monument, Ariz., 42 acres, July 25, 1939; Whitman National Monument, Wash., 45 acres, January 20, 1940; Appomattox Court House National Historical Monument, Va., 970 acres, April 10, 1940.

On June 3, 1940, the President by Executive Order No. 8428 transferred to this Service the Custer Battlefield (Mont.) National Cemetery of approximately 640 acres. The order became effective on July 1, 1940.

The Mount Rushmore National Memorial, containing 1,465.51 acres, was transferred to the jurisdiction of the National Park Service by the Second Plan of Government Reorganization.

Under authority of the Historic Sites Act the establishment of the Manassas National Battlefield Park, Va., 1,604 acres, May 10, 1940, completes the roster of new areas acquired during the fiscal year.

Changes in existing Federal park areas.—Olympic National Park, Wash., was increased by 187,411 acres, January 2, 1940; Black Canyon of the Gunnison National Monument, Colo., by 2,771 acres, October 28, 1939; Scotts Bluff National Monument, Nebr., by 46.17 acres, March 29, 1940.

Grand Canyon National Monument, Ariz., was reduced from 273,145 to 201,291 acres, on April 6, 1940.

New designations.—To bring their designations into conformity with the actual character of the areas, Abraham Lincoln National Park, Ky., was redesignated Abraham Lincoln National Historical Park; Fort McHenry National Park, Md., became Fort McHenry National Monument and Historic Shrine; and Chalmette Battlefield Site, La., was redesignated Chalmette National Historical Park.

FURTHER ADDITIONS TO EXISTING FEDERAL PARK AREAS

In addition to the new Federal park areas established, and the enlargement of existing areas already noted, the following lands were added during the fiscal year 1940 to the Federal park system through the adjustment of boundaries of established areas and the acquisition of lands for authorized projects:

Acadia National Park, Maine.—Donations of 1,229.55 acres brought the total area of this park to 17,752.042 acres.

Atlanta campaign markers.—Donations of 20.45 acres were accepted for these markers.

Badlands National Monument.—By transfer from the Department of Agriculture 1,289.39 acres were added to the Government-owned land in this monument.

Blue Ridge Parkway.—Donations of 2,023.45 acres increased the lands acquired for the parkway to 24,600.72 acres.

Boulder Dam National Recreational Area.—Donation of 11.32 acres increased the total holdings of Federal lands to 1,439,843.62 acres.

Capitol Reef National Monument.—Donation of 0.96 acres increased the total holdings of Federal lands to 35,180.96 acres.

Chaco Canyon National Monument.—Donation of 0.92 acres increased the total holdings of Federal lands to 17,636.73 acres.

Chalmette National Historical Park.—By act of August 10, 1939, the Chalmette National Cemetery of 13.60 acres was made part of the national historical park.

Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park, Va.—Donations of 168 335 acres resulted in a total area of 2,399.306 acres.

Glacier National Park.—The purchase of 184.53 acres and the elimination of unsurveyed State sections from private holdings resulted in total Federal holding of 968,171.23 acres.

Grand Canyon National Park.—The purchase of 207.70 acres and the elimination of unsurveyed State sections from private holdings resulted in total Federal lands in this park of 644,395.017 acres.

Great Sand Dunes, Colo.—The acquisition of 28.01 acres by donation brought the Federal lands in the monument to 37,139.714 acres.

Great Smoky Mountains National Park.—The purchase of 2,483.31 acres and the elimination of 2,394.80 acres by exchange resulted in a total acreage of 439,365.875 acres in this park.

Guilford Courthouse National Military Park, N. C.—The acquisition of 2.09 acres by donation brought the total area of this military park to 148.864 acres.

Jefferson National Expansion Memorial project.—The acquisition of 2.826 acres by purchase and 0.779 acres by transfer started this project.

Kennesaw Mountain National Battlefield Site.—The purchase of 499.97 acres resulted in a total area of 2,077.90 acres.

Mammoth Cave National Park, Ky.—The acquisition of 2,145.37 acres by donation and purchase brought the total acreage to 42,631.75 acres.

Natchez Trace Parkway.—The acquisition of 5,126.221 acres by donation brought the total lands acquired for the parkway to 9,814.139 acres.

Petersburg National Military Park, Va.—The acquisition of 15.45 acres by donation and purchase resulted in this park having a total area of 2,046.905 acres.

Petrified Forest National Monument, Ariz.—The acquisition of 2,563.38 acres by exchange brought the total Federal lands in the monument to 77,464.73 acres.

Rocky Mountain National Park.—The acquisition of 160 acres by purchase brought the total Federal lands in this park to 252,073.40 acres.

Shenandoah National Park.—The acquisition of 640.10 acres by donation brought the total acreage of this park to 183,311.69 acres.

Vicksburg National Military Park, Miss.—The acquisition of 11.51 acres by donation resulted in a total acreage of 1,337.998 acres.

White Sands National Monument.—The acquisition of 1,793.33 acres by exchange brought the Federal lands in this monument to 133,366.150 acres.

Yellowstone National Park.—The acquisition of 228 acres by purchase brought the Federal lands in this park to 2,213,229.97 acres.

Yosemite National Park.—The completion of the acquisition in the authorized Carl Inn extension added 8,206.78 acres to the park and resulted in a total area of 761,111.10 acres.

PROPOSED EXTENSIONS TO EXISTING FEDERAL PARK AREAS

Rocky Mountain National Park, Colo.—The act approved June 21, 1930, authorized additions to the park, by proclamation, of certain lands in the Estes Park and Grand Lake areas. Two proclamations adding small tracts were issued in 1930 and 1932. There still remains considerable acreage to be added under this authorization, which is now related to S. 2651 and H. R. 6655, providing for lands in addition to the 1930 authorization that are essential for an entrance parkway, and to round out the park.

Kings Mountain National Military Park, S. C.—It is proposed to increase this area to 4,012 acres by means of a departmental order transferring a portion of the lands in the Kings Mountain Recreational Demonstration Project to the existing national military park.

STATUS OF FEDERAL PARK AREAS AUTHORIZED BY CONGRESS

Cumberland Gap National Historical Park project, Tennessee, Kentucky, Virginia.—An act approved June 11, 1940, authorized establishment of this area, when lands determined to be necessary by the Secretary of the Interior, not exceeding 50,000 acres, have been donated to the Federal Government. Cumberland Gap is one of the most famous mountain passes in America. Traveled by Daniel Boone and other pioneers, who knew it as the "Wilderness Road," and before them by the Indians, it became the gateway through which flowed much of the westward travel out into the rapidly developing Nation.

Big Bend National Park project, Texas.—Authorized by act of June 20, 1935, considerable progress has been made with this 788,682-acre project. The State of Texas is now in a position to transfer to

the Federal Government all of its holdings within the proposed boundaries, totalling some 132,107 acres. A campaign to raise funds by public subscription for purchase of additional lands was started 2 years ago.

Everglades National Park project, Florida.—Authorized by act of May 30, 1934, this 1,545,092-acre project has received new impetus through the strong approval of the proposal indicated by Governor-elect Holland, with accompanying support throughout the State. At present the National Park Service, the Biological Survey, the National Association of Audubon Societies, the Coast Guard, and the State are cooperating in protection of the wildlife and other features of the area.

Saratoga National Historical Park project, New York.—Authorized by act of June 1, 1938. The board of land commissioners of New York has approved transfer of State-owned lands in Saratoga Battlefield, aggregating 1,492 acres, to the Federal Government for inclusion in the park. The 1941 Interior Department Appropriation Act made available \$50,000 for the purchase of approximately 950 acres which must be acquired before the park can be established.

Cape Hatteras National Seashore Recreational Area project, North Carolina.—Pursuant to the act of August 17, 1937, authorizing the Cape Hatteras National Seashore Project, a State Cape Hatteras National Seashore Commission was appointed for the purpose of furthering the land acquisition program. An appropriation of \$10,000 per year was made by the State to meet the expenses of the commission during the 1939 and 1940 fiscal years. The act of June 29, 1940 changes the designation of the area to Cape Hatteras National Seashore Recreational Area and permits limited use of the area for hunting consistent with its proper conservation.

Monocacy National Military Park project, Maryland.—Authorized by act of June 21, 1934. During the year studies were made to determine the sites necessary to tell the story of the Battle of Monocacy, and on which suitable markers can be erected describing the action of the Confederate and Union forces here on July 9, 1864.

Richmond National Battlefield Park project, Virginia.—Authorized by act of March 2, 1936. Establishment of this area awaits clearance of titles to the lands acquired by the State of Virginia for donation to the United States.

Andrew Johnson Homestead National Monument project, Tennessee.—Authorized by act of August 29, 1935. Acquisition of President Johnson's home is made possible by an appropriation of \$44,500 in the 1941 Interior Department Appropriation Act.

Patrick Henry National Monument project, Virginia.—Authorized by act of August 25, 1935. The Interior Department Appropriation

Act for 1941 provides \$25,000 towards the purchase of the Red Hill Estate, home of Patrick Henry.

In addition to the above, there are five previously authorized projects: Fort Frederica, Ga., Fort Stanwix, N. Y., Palm Canyon, Calif., Pioneer, Ky., Spanish War Memorial, Fla., in connection with which no important developments occurred.

PROPOSED ADDITIONS TO FEDERAL PARK SYSTEM

Rehoboth-Assateague National Seashore, Delaware, Maryland, Virginia.—H. R. 9718 introduced on May 9, 1940, would authorize establishment of a stretch of the Eastern Shore for national seashore purposes. Study of the merits of the area, in cooperation with interested local people, was carried on during the year.

Studies in connection with a number of other national seashore possibilities were continued. Included in these considerations were the Barnegat Inlet region of New Jersey, Anastasia Island, Fla., and Padre Island, Tex.

Tensas Swamp National Park, La.—Proposed by H. R. 9720 and S. 4047, introduced May 9, 1940. This area in Madison Parish is distinguished by its extensive stand of virgin timber of rare bottomland hardwoods type, none of which is found in any area of the national park system, and its unusual scenic and biological qualities.

Oregon Coast National Park, Oreg.—Proposed by S. 4064, introduced May 29, 1940. The area, in Curry County, embraces one of the most rugged and scenic portions of the Pacific coast, and is a practically unmodified area combining many outstanding geological and biological features.

Coronado International Monument, Ariz.—An act of July 17, 1939, authorized an expenditure of not to exceed \$10,000 for erection of a suitable monument at or near the point on the international boundary between the United States and Mexico where Coronado first entered what is now the United States. S. 4130, introduced on June 12, 1940, authorizes the President to establish by proclamation an area of approximately 2,960 acres as the Coronado International Monument. The Government of Mexico has been invited by the Department of State to participate in the commemoration of Coronado's expedition by establishing a companion park or monument of approximately the same shape and size on its side of the border.

Adirondack National Recreational Area, New York.—Proposed by S. 3840, introduced April 24, 1940. The bill provides that such an area shall be established when title to such lands within the region of the Adirondack Mountains as may be determined by the Secretary of the

Interior as necessary for this purpose shall have been vested in the United States.

Saint John Island National Recreational Area, Virgin Islands.—Proposed by H. R. 9621, introduced May 1, 1940. Saint John Island, one of the small islands terminating the Lesser Antilles, is distinguished by magnificent beaches, richly colorful forests, and luxuriant and diversified flowering forms. Establishment of this area would provide excellent recreational opportunities for the public, and the economic condition of the approximately 800 natives would be benefited by an increase in tourist trade.

Escalante, Southeastern Utah.—The proposal to establish this area as a unit of the national park system was given considerable impetus. It is proposed to handle the recreational resources of the area, together with the water control, grazing, mining, and other industrial interests therein, under one completely integrated program. This 1,280,000-acre area is practically all in Federal ownership.

Ship Island, Miss.—Located in the Gulf of Mexico, near Gulfport and Biloxi. National monument status is fully justified because of the area's historical significance. It was an important point in the first French settlement of Louisiana; was used as headquarters by British General Packingham prior to his descent on New Orleans in 1814–15, and was a Union navy yard for the Gulf blockading squadron during the War Between the States.

Manuelito, N. Mex.—This proposal for a national monument of approximately 30,000 acres would preserve a highly important link in Southwestern archeology. Its scientific importance has long been recognized by the Smithsonian Institution, National Park Service, and other organizations. During the year, New Mexico cooperated generously in the proposal by purchasing a number of private holdings within the area, and expects ultimately to turn them over to the Federal Government for monument purposes.

FOREST PROTECTION AND FIRE PREVENTION

Fire record.—The forest-fire record for the calendar year 1939 suffered in comparison with 1938 because of one bad fire in Yellowstone National Park. The total number of fires affecting the national parks and monuments was 555, of which 193, or 35 percent, were caused by lightning and 362, or 65 percent, by human agency.

The largest fire in 1939, and the largest that has occurred in Yellowstone since 1931, was the Astringent Creek fire which started from lightning on July 15. This fire burned an area of 1,561 acres, which was more than half the total burned area for the entire national park system for the year.

In the face of most unfavorable weather conditions the Service held its total burned area to only 2,920 acres. Intensive training, plus additional fire guards and equipment, were important factors and contributed greatly to this low loss.

Statistics of the 1939 fire record and of the 10-year fire record (1930 to 1939, inclusive) are shown on page 209.

Fire-protection training.—As in previous years, fire-protection training was particularly stressed. Besides training in fundamentals, which is required of all protection personnel within the Service, emphasis during the year was given to more advanced training to acquaint protection personnel with methods of organization for large fires.

Fire equipment.—As additional protection for both forests and buildings, five 1½-ton fire trucks equipped with water tanks, pumpers, and hose were provided as follows: One each to Yosemite and Mammoth Cave National Parks, Vicksburg and Chickamauga-Chattanooga National Military Parks, and Blue Ridge Parkway.

Detection system.—Improvements in the fire-detection systems within national park areas were provided by the installation of additional fire lookout structures at Mount Washburn in Yellowstone, at White Rock in Great Smoky Mountains, and at Park Point in Mesa Verde National Park; and by erection of one lookout tower in each of the following: Isle Royale and Shenandoah National Parks, Shiloh National Military Park, and Chopawamsic and Versailles Recreational Demonstration Areas. Additional fire lookouts are now under construction in Grand Canyon, Great Smoky Mountains, Shenandoah, and Isle Royale National Parks, and in Bandelier and Lava Beds National Monuments.

Protection planning.—The value of the accumulated fire-protection statistical data for the past 10 years is becoming increasingly evident. This information has facilitated revisions of previous reports of forest-protection requirements for personnel, equipment, and physical improvements so as to improve protection in many areas. It is hoped this study of forest protection requirements for all areas may be completed within the coming year.

C. C. C. assistance in forest protection.—As in preceding years since the establishment of the Civilian Conservation Corps, that organization has been the mainstay for fire suppression, insect and tree disease control, and tree preservation work.

Insect control.—In the Eastern States forest insect conditions were largely endemic. Encouraging progress has been made toward controlling the beech scale at Acadia National Park, an insect which threatens to wipe out unprotected beech forests in the East. Parasitic control of the European spruce sawfly at Acadia is being con-

tinued with indications of success. The southern pine beetle, which had given considerable trouble at Great Smoky Mountains National Park, was virtually controlled by the natural agency of extraordinarily low winter temperatures.

In the Rocky Mountain region forest insect conditions are improved over the previous year. Effective control work against the Black Hills beetle was carried on at Rocky Mountain National Park and Jewel Cave National Monument. The mountain pine beetle infestation in Yellowstone and Grand Teton National Parks has not materially spread. In the latter park continued work with penetrating oils has met with success.

In the Southwest, forest insect conditions were largely endemic, with the exception of the oak looper infestation on Gambel's oak at Mesa Verde. This infestation has now spread over the entire northern half of the park. Control of the Black Hills beetle in Bryce Canyon National Park was continued during the past fall and spring.

In the national parks of Pacific Coast States the most serious problem is in Yosemite National Park. In spite of excellent work done by the C. C. C. a considerable area has received no treatment for the control of *Dendroctonus* in pine owing to the nonavailability of camps when needed and inaccessibility for this type of labor.

White pine blister rust.—In the East white pine blister rust control has been continued in Acadia, Shenandoah, and Great Smoky Mountains National Parks, and plans are being made for work along the Blue Ridge Parkway.

In the Rocky Mountain region plans are being formulated for initial work in Yellowstone.

The advance of the white pine blister rust to the sugar pine forests of California has created a formidable problem in control. The program for control activities has been thoroughly worked out, but appropriations in sufficient amounts have not been made available to enable the Service to maintain the original schedule planned by the Bureau of Entomology and Plant Quarantine. With the exception of fire protection, this is the greatest forest protection problem confronting the Service. During the year initial eradication was accomplished on 31,480 acres in the Western States, bringing its total eradication roughly to 15 percent of the area that must be covered in the western national parks.

Campground protection.—The protection of public campgrounds against deterioration is one of the most urgent forest-protection problems. Studies are being continued to determine the present condition of trees and other vegetation in the intensively used campgrounds of the western national parks. Measures have been taken to protect some of the campgrounds and where this has been done some improvement

has been noted. Studies will continue and measures will be taken to protect the vegetation in these campgrounds insofar as practicable.

Type mapping.—No field type mapping was accomplished during the year. An E. R. A. project in Region IV headquarters in San Francisco continued preparation of copies of type maps for park areas in all regions.

Forest nurseries and planting.—Forest nurseries were operated during the year in Sequoia, Shenandoah, Great Smoky Mountains, and Yellowstone National Parks. In the latter two parks the nursery production is being slowed up, as the peak of their needs for forest-seedling stock has passed. Altogether about one and three-quarter million forest seedlings were planted during the year on areas within the national park system, the stock coming either from National Park Service or Soil Conservation Service nurseries.

PLANNING AND CONSTRUCTION

The planning and general development of new areas and the planning and construction of buildings, bridges, and roads in established areas continued during the 1940 fiscal year on a limited basis. Owing to a curtailment of construction funds, few new projects other than buildings were started, and money was allocated to continue construction on only the most urgent road projects.

Under the road and trail appropriation made available through the Interior Department Appropriation Act, the sum of \$3,500,000 provided for continuation of grading already commenced on a few park roads and approach roads, and for surfacing, guard rail, and post construction to other existing roads. The Public Roads Administration, formerly the Bureau of Public Roads, continued to construct major roads for the Service.

The \$2,000,000 P. W. A. physical-improvement program initiated just before the close of the 1938 calendar year now is substantially completed. In this program were included approximately 100 urgent engineering projects for extensions or replacements to existing water supply, sewage and garbage disposal, and electric power and telephone systems. Also completed under this program were the administration buildings at Great Smoky Mountains and Shenandoah National Parks and a number of other buildings.

Outstanding physical-improvement items for which plans were prepared included administration-museum buildings at Kings Mountain National Military Park and Manassas National Battlefield Park, administration and operators' buildings and general development of the Statue of Liberty, and rehabilitation of the Philadelphia Custom House.

Studies for the development of a number of new areas were commenced, including Kings Canyon National Park, the additions to Olympic National Park, the Vanderbilt Mansion National Historic Site, New York, and the Saratoga National Historical Park project.

Approximately 1,000 job plans were reviewed, including work under all programs (regular park appropriations, C. C. C., P. W. A., E. R. A., W. P. A., etc.). This does not include the mass job plans handled by the regional staffs for State-park, recreational-demonstration, and land-development areas.

Road-maintenance problems for all Service areas demanded increasing attention. Detailed road data and equipment records were maintained to assist the Service in formulating a comprehensive road-maintenance program.

Special study was given to water-supply and waste-disposal problems, reinforced concrete construction, and the design and construction of earthworks.

ENGINEERING LABORATORY

The field of usefulness of the engineering laboratory was extended to include road materials and construction, the preservation of archeological ruins, and even certain phases of forestry and horticulture. A short course in the theory and application of soil mechanics was given to promote greater appreciation of the value and a wider application of this new and important engineering tool.

Cooperative technical assistance was rendered to the Indian Service in connection with the proposed Gila River Dam and with the Truckee River stabilization in Nevada. Laboratory assistance was given the Forest Service in the investigation of soils for a large dam to be constructed in Puerto Rico.

FIELD RADIO SYSTEMS

Park Service research has resulted in the development of a new type of radio antenna for ranger patrol cars which has created Nation-wide interest, especially among Federal and State agencies. Work is now in progress on the development of a compact ultra-high frequency radio field set that bids fair to surpass anything in this line that has heretofore been available.

The use of radio in general was expanded in the national parks and monuments. A complete new system was designed and installed in the Boulder Dam National Recreational Area. A new system for the Blue Ridge Parkway was designed and construction has started thereon.

PARKWAY DEVELOPMENT

The Blue Ridge and Natchez Trace Parkways, pioneers in their respective fields of recreation and historical motor travel, continued under development with regular Federal appropriations totaling \$4,500,000 for the 1940 fiscal year.

The Blue Ridge Parkway now has 149 miles graded and hard-surfaced, an additional 50 miles graded, and 94 miles under grading contracts. A continuous 140-mile paved unit between Adney Gap, Va., and Deep Gap, N. C., was opened to travel this spring. Development of recreational parks adjacent to the parkway road continued with C. C. C. and E. R. A. forces.

On the Natchez Trace Parkway project grading and bituminous surfacing were completed on 3 sections totaling 36 miles in Mississippi. One section of 11 miles has been graded and 29 miles additional are under construction in Mississippi. In Tennessee 9 miles are under construction. Survey and location work was carried on in Mississippi, Alabama, and Tennessee in collaboration with the Public Roads Administration.

The contracting for a tunnel under Williamsburg, Va., marked the start of the continuation of the Colonial Parkway from that city to Jamestown Island.

ACCOMMODATIONS FURNISHED BY PARK OPERATORS

Hotel and lodge accommodations furnished by private capital in the national parks and monuments and rates charged therefor were given especial attention at the National Park Service Conference held in Santa Fe, N. Mex., October 2 to 8, 1939. Four classifications of cabins were recommended, with specified rates for different types of occupancy. Although not making compulsory the furnishing of all such types of service in every national park or prohibiting rates in excess of those recommended, the Service is requiring special justification in all cases not in conformity with the conference recommendation. A further recommendation of the conference that certain minimum rates be established for popular-priced meals is being generally met by the park operators.

Under a newly established policy, park operators are required to include, with plans of public facilities submitted for approval, data as to cost of construction, proposed rates, and estimated revenue, expense, and resulting net profit, to provide reasonable assurance of satisfactory operation of the proposed facilities on a sound economic basis.

Progress has been made in the control of the prices of groceries, food supplies, and other items coming under the general heading of necessities, to the end that the prices be comparable with those in nearby shopping centers deemed to be in competition for the park business.

In the newer eastern park areas, a policy is gradually being formulated whereby only the daytime needs of visitors for gasoline, oil, food, and picnic supplies shall be met by operations within the parks. The Department favors development of overnight accommodations by private enterprise outside park boundaries.

Proposals for the operation of souvenir concessions in new national parks provide that only native handicraft articles made in the vicinity shall be sold.

During the year the Service continued to cooperate with various park operators in connection with applications for loans pending before the Reconstruction Finance Corporation for the purpose of installing new or additional park facilities.

Effective June 15, regulations with regard to minimum wages and maximum hours of employment of employees of park concessioners, as promulgated on June 18, 1940, were superseded by new regulations amended so as to be in conformity with the Motor Carrier Act of 1935 and the Fair Labor Standards Act of 1938.

After most careful consideration and study, extending over a period of years, on June 10 the Department approved the experimental installation of binocular scenic view finders equipped with coin-operating devices. Sixteen binoculars will be operated by the Service in this try-out, and five by concessioners.

Efforts are being made by both the park operator and the Service to have ready for occupancy by the beginning of next season a new hotel to replace Volcano House, the famous old hostelry on the rim of Kilauea Volcano in Hawaii National Park, destroyed by fire last winter.

The development of the Bright Angel Lodge area in Grand Canyon National Park was completed at a cost of approximately \$300,000. The development for the accommodation of Negroes at Lewis Mountain in Shenandoah National Park has just been completed. Considerable improvements have been made in the Old Faithful Lodge area in Yellowstone National Park. In connection with the lessening of the standard tour of Yellowstone National Park from 3½ to 2½ days, the bus transportation rate was reduced from \$25 to \$22.50.

The Lassen National Park Co. is constructing new "hotel bungalows" in the Manzanita Lake Area in Lassen Volcanic National

Park, in anticipation of the development of all-expense trips between the park operator and the Western Pacific and Southern Pacific Railroads. The Glacier Park Hotel Co. started construction on its new lay-out at Rowe's Creek in Glacier National Park.

Bids were solicited the second time for the furnishing of services to the public in the Government-owned building at the Painted Desert in Petrified Forest National Monument. In Muir Woods National Monument space will be provided for the operator in the administration building now under construction.

After careful preliminary study, proposals were solicited for furnishing minimum daytime use facilities for the public along the Blue Ridge Parkway. The parkway has been divided into seven divisions for concession-operating purposes, four in North Carolina and three in Virginia. No bids were received for furnishing these facilities in division III in Virginia and division V in North Carolina.

The Service is still endeavoring to secure a satisfactory operator to furnish boat service at Isle Royale National Park.

In accordance with the opinion of the Solicitor of the Department and past Service policy all concession permits and contracts granted by the Forest Service in the Kings Canyon National Park and the extension to the Olympic National Park while those areas were under the jurisdiction of the Department of Agriculture are being continued in effect until date of termination.

NATIONAL CAPITAL PARKS

At the request of the Secretary of the Interior a study was made of the organization of the National Capital Parks system by H. S. Wagner, secretary of the Board of Park Commissioners of Summit County, Ohio, and Charles G. Sauers, superintendent of the Cook County Forest Preserve, Ill., following the resignation, through ill health, of Supt. C. Marshall Finnan. Their report, recommending certain changes in the organization and policies of the park office, was submitted in November 1939. The Secretary then requested the Civil Service Commission to conduct examinations to fill the position of superintendent of National Capital Parks, which has been vacant since the beginning of the fiscal year. The Commission is now passing upon the qualifications of the applicants.

Development for human use characterized the progress achieved in expansion of facilities in the local park system during the year. Public appreciation was indicated by the approximately 53,000,000 persons enjoying the parks.

Improvement of major recreation centers, the reconstruction of the Chesapeake & Ohio Canal as a recreational waterway, several projects

to facilitate the flow of traffic over major traffic arteries in the park system, and other projects of a purely utilitarian character were the high lights of the year's development program.

Of especial interest was the opening to the public of Kenilworth Aquatic Gardens, formerly the Shaw Lily Gardens. These gardens, purchased from private ownership for \$50,000 in the fall of 1938 by the United States Army Engineers in connection with flood control, later were transferred to the National Park Service and now are administered as a unit of the National Capital Parks system. The gardens contain more than 100,000 aquatic and subaquatic plants, featuring the more colorful and spectacular varieties of water lily and lotus and provide a park facility of unusual beauty and interest.

Appropriations totalling \$1,852,388 were accounted for during the year. In addition to regular appropriations, this total includes funds for the maintenance of the White House, the operation of five C. C. C. camps, P. W. A., and roads and trails projects.

The construction of an additional arch at the southern end of Key Bridge, to permit the westward extension of the George Washington Memorial Parkway, was completed, and the reconstruction of the Rosslyn Plaza reached an advanced stage. Contract was awarded and grading operations started on the construction of a traffic circle on Columbia Island at the intersection of Memorial Avenue and the George Washington Memorial Parkway. A major program for surgical treatment, cabling, bracing, and pruning of trees in the older parks was successfully carried out.

Directly affecting the park system, although undertaken by other official agencies, were the construction of the National Airport, the Thomas Circle underpass, the Rock Creek diversion sewer, the K Street overpass, and the Massachusetts Avenue bridge projects. Each of these necessitated close cooperation between the National Capital Parks and the agency executing the work and involved reconstruction of park roadways, protection and transplanting of landscape materials, etc.

SANITATION AND SAFETY PRECAUTIONS

Safeguarding the public health is one of the most important phases of national park administration. Visitation of park areas by more than 15 million persons in the course of the year, plus the housing of thousands of employees for periods ranging from a few months to the entire year, creates serious problems of sanitation and public health. To insure the most competent handling of these problems, the National Park Service for a number of years has availed itself

of the cooperation of the outstanding technical agency in this field—the Public Health Service of the Federal Security Agency.

Sanitary engineers of that bureau inspected water supplies, sewerage and sewage disposal, garbage disposal, camps and picnic grounds, swimming pools, and food-handling places in approximately 50 Federal park areas. Approximately 250 plans for the installation of sanitation facilities were reviewed and approved by Public Health engineers.

At the Public Health Service Laboratory in San Francisco bacteriological analysis of 571 samples of water were made, and chemical analyses of 18 samples were made at the California State Hygienic Laboratory. The operations of the swimming pools and recreational areas in the National Capital parks were checked by weekly inspections and laboratory examinations of water samples made in Public Health Service Laboratories. Bacteriological examinations of water in other eastern areas of the Federal park system were made by State health department laboratories.

Careful checks were made of activities connected with the operation of the sewage-water reclamation plant at the south rim of the Grand Canyon and the activated sludge plant in Yosemite Valley, Yosemite National Park, since it is of vital importance that these plants produce highly purified and completely disinfected effluents. The results from both plants were highly satisfactory throughout the year.

Precautions also were taken by the Service against accidents to the visiting public and employees, and to property. Surveys were made at major areas for the purpose of organizing the safety work in the field, training employees in the detection and correction of hazards, and for technical studies of fire protection systems and public safety. Safe practice standards were prepared for use in design, construction, and operation. Such standards include one for propane gas, one for motorboats, and one for oxyacetylene flames.

The Service cooperated with organizations outside the Federal Government through representation on technical committees of national scope. Such cooperation affords opportunities to make contributions in the preparation of standards of interest to the Service and to profit from the views of others interested in accident and fire prevention.

The Service's work in safety has been somewhat handicapped by the lack of adequate personnel to accomplish the objectives desired in safety. Notwithstanding such obstacles, substantial savings have been effected in the compensation costs due to personal injuries to employees since this Service established its Safety Division in March 1937. For example, in 1936 the compensation costs for personal injuries were

about \$156,000, while in 1938, with a 6-percent reduction in personnel, they were about \$85,000, or more than 45 percent decrease. The preliminary figures for 1939 show a further substantial decrease. Such savings are in the public interest; and, even more important, accident prevention activities are a contribution to efficiency as enforced absence of personnel from their regular work results in interference with the orderly operation of an organization's functions.

The National Park Service has continued to participate in the leadership of both the Federal Fire Council and the Federal Interdepartmental Safety Council.

CIVILIAN CONSERVATION CORPS COOPERATION IN PARK WORK

The National Park Service quota of 310 continental C. C. C. camps remained unchanged for the 1940 fiscal year. Ninety camps were operated on national parks and monuments, 22 on recreational demonstration areas, and 198 on State, county, and metropolitan parks. Camps were established for the first time in the Badlands and Chaco Canyon National Monuments, Saratoga National Historical Park project, and Kings Canyon National Park.

Notable improvement was made in work accomplishments during the year, due to better advance planning.

C. C. C. activities in the territories of Hawaii and the Virgin Islands were authorized for 675 enrollees on five projects in Hawaii, 225 additional enrollees in Hawaii National Park, and 500 enrollees on three projects in the Virgin Islands. Activities of the C. C. C. in the territories are similar to and work accomplishments comparable with those of the continental camps. Unlike continental camps, they are operated solely under National Park Service jurisdiction, with food, clothing, medical attention, salaries, recreation, enrollee welfare, and related items, as well as supervision of the work programs, provided by the Service.

The broad program of conservation and recreational development was continued. Such recreational facilities as minor roads, dams, cabins, and other simple park structures, water and sanitary systems, picnic grounds and related facilities, for both extended and day use of areas, were provided to meet public needs. Much progress was made in the conservation of natural resources of water, soil, forest, and wildlife by fire hazard reduction, fire prevention, erosion control, tree and cover planting, forest stand improvement, insect and pest control, etc. Preservation of natural features and scenic values and the rehabilitation and preservation of areas of historical, geological, and archeological importance were continued.

A few items of interest, completed or nearly so, are the public campgrounds and related facilities at Smokemont in the Great Smoky Mountains National Park, trailside shelters along the Appalachian Trail, the amphitheater and the telephone system in Mammoth Cave National Park, reconstruction of the historic Chesapeake & Ohio Canal between Washington and Seneca, Md., and the extension of facilities for winter sports in both National and State parks.

RECREATIONAL DEMONSTRATION AREAS

The 46 Recreational Demonstration projects, authorized under the National Industrial Recovery Act of 1933 as part of a comprehensive program of public works, which numbered 43 in 1939, were further reduced in number when the Bull Run project of 1,476 acres, with additional donated land, became the Manassas National Battlefield Park on May 10, 1940.

Development of the remaining 42 projects in 51 areas was continued, though to a lesser degree than in former years, and consisted principally of provision of administration buildings, picnic areas, extension of organized camping facilities, and trailside improvements including construction of shelters and camp sites.

Visitation to these areas for public recreation and organized camping has doubled each year for 3 successive years. Approximately 600 rural and urban organizations from 200 different communities use the group camping facilities which accommodate about 7,500 persons at one time.

No regular appropriation has yet been made to administer and operate these areas.

EMERGENCY RELIEF ACT PROJECTS

The National Park Service received \$5,467,839, plus administrative funds, from the Work Projects Administration for the operation of 83 development and white collar relief projects, employing a monthly average of 6,614 workers during the year. Development projects were prosecuted on 37 recreational demonstration areas, 13 national monuments, 2 sections of a national parkway, 2 national historical areas, 1 national military park, and 1 proposed national seashore. Seventeen white-collar projects were engaged in statistical analyses, travel bureau, guide and contact station work, and important research.

Work on national park and monument areas comprised restoration and preservation of features of natural and historical importance, scientific research connected with naturalist, archeological and geological programs, guide service, construction of simple park facilities,

and conservation of soil, forests, and waters. Areas of historical interest which benefited from restoration and preservation by E. R. A. forces are Fort Marion National Monument, Fla.; Fort Jefferson National Monument on the Dry Tortugas Key off the coast of Florida; Fort Laramie National Monument, Wyo.; Salem Maritime National Historic Site, Mass., and Homestead National Monument of America, near Beatrice, Nebr.

Work on recreational demonstration areas tapered off materially from last year and consisted of constructing additional facilities for organized camping, swimming, boating, picnicking, and operating, administering, and protecting these areas. Although no new camps were started, much was accomplished to meet demonstrated needs of the operating units.

Through the cooperation of the city of Memphis, which furnished salvaged materials, the Shelby Forest Recreational Demonstration Area was able to construct a custodian's residence, dam, lodge, and affiliated recreational facilities.

The record of the past 7 years in national park work reveals that in 1933 the national park system was increased from a total of 63 national parks and monuments with a total area of 14,701,000 acres, to a system of 128 national parks, monuments, military and historical parks, memorials, and allied areas, through President Roosevelt's Executive order consolidating the administration of all Federal park areas and activities under the National Park Service. One of these units was the National Capital Parks system containing nearly 700 areas and involving a multiplicity of new detail. At the close of the 1940 fiscal year, the total number of areas administered by the Service was 161, totaling 21,550,783 acres. These totals do not include the 42 recreational demonstration areas now operated by the Service, which eventually either will be consolidated with existing Federal parks or will be turned over to the respective States to maintain.

These increased responsibilities stress the need for a permanent Civil Service personnel adequate to carry on the growing Service activities. When the many new duties came to the Service in 1933 through consolidation and relief work, 2,027 permanent employees were conducting all Service work. At the peak of Public Works and other emergency activities, the total personnel amounted to 13,900. At the end of June 1939 the total was 13,751. By June 1940, partly through transfer of the Buildings Branch to the Federal Works Agency, this figure had been reduced to 7,341 employees. Of these, 3,956—more than 50 percent of the total personnel—hold appointments under P. W. A., C. C. C., and E. R. A.—rolls which for several years past have been consistently reduced and which undoubtedly will be more

drastically curtailed in the future as defense activities are expanded. In other words, the personnel of the National Park Service is constantly decreasing, despite the definite upward surge of activities. Steps should be taken to secure funds for adequate civil service permanent personnel to conduct the regular Service activities now maintained through emergency personnel. This applies not only to many activities in the Washington office financed through emergency funds, but also to the administration of numerous field units, in particular those historical areas transferred to the Service in the 1933 consolidation with no funds for their administration or maintenance.

New areas were not the only new responsibility placed upon the National Park Service during the summer of 1933. Then also came the necessity of providing public relief projects—a fight of depressed economic conditions in which the Service wholeheartedly joined. In cooperation with the Public Works Administration, the Civilian Conservation Corps, the Civil Works Administration, and other emergency agencies, projects were initiated and put into operation. Because of the nature of the Federal parks, and the duty of the Service to preserve them in their natural or historic condition, meticulous care was necessary in planning for all emergency work, to insure against developments out of keeping with the inherent principles of national park preservation.

Placing all park administration, protection, and maintenance on a permanent civil-service basis, under appropriations made direct to the National Park Service, would be a forward step in park administration and in the long run an economical one, eliminating the constant turnover in personnel inherent in emergency, non-civil-service positions. Elimination of these abnormal turnovers and of the consequent vast amount of paper work entailed and the building up of stabilized permanent personnel would release many employees in the Service, the Office of the Secretary, and the Civil Service Commission for other needed work.

(After 7 years of outstanding service in the administration of the national park system, Mr. Arno B. Cammerer was forced by ill health to submit his resignation as Director of the National Park Service shortly before the close of the fiscal year. Mr. Newton B. Drury, of California, was selected by Secretary of the Interior Harold L. Ickes to be successor to Mr. Cammerer on August 20, 1940.)

TABLE 1.—Holdings acquired for national park and monument purposes

Federal park system	Holdings acquired from July 1, 1939, through June 30, 1940					
	Holdings acquired by purchase			Holdings acquired otherwise than by purchase		Total holdings acquired through June 30, 1940, in acres
	Government funds	Donated funds	Area in acres	How acquired	Area in acres	
Acadia National Park				Donation	1, 229, 550	1, 229, 550
Appomattox Court house National Historical Monument	\$8, 000. 00		6, 370	Donation		6, 370
Atlanta campaign markers				Donation	20, 450	20, 450
Badlands National Monument				Transfer	1, 289, 390	1, 289, 390
Blue Ridge Parkway				Donation	2, 023, 450	2, 023, 450
Bozeman Dam National Recreational Area				do	11, 320	11, 320
Capitol Reef National Monument				do	960	960
Chaco Canyon National Monument				do	920	920
Chalmette National Historical Park				Transfer	13, 600	13, 600
Chickamauga and Chattanooga National Military Park				Donation	-91, 230	-91, 230
Colonial National Historical Park					139, 550	139, 550
Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park	17, 578. 00			Donation	168, 335	168, 335
Glacier National Park	14, 055. 36		184, 530	Exchange		184, 530
Grand Canyon National Monument	28, 950. 00		207, 700	Donation	28, 010	28, 010
Grand Canyon National Park				Donation	2, 090	2, 090
Great Sand Dunes National Monument				Transfer	3, 060, 620	3, 060, 620
Great Smoky Mountains National Park	121, 282. 07		188, 510	Donation	779	779
Guilford Courthouse National Military Park				Donation	2, 090	2, 090
Isle Royale National Park	94, 491. 08	\$23, 943. 46	14, 961, 480	Donation	2, 090	2, 090
Jederson National Expansion Memorial project	319, 986. 00		2, 826	Transfer	3, 605	3, 605
Kennesaw Mountain National Battlefield Park	20, 446. 10		499, 970	Donation	499, 970	499, 970
Kings Canyon National Park	626, 011. 00		4, 000, 000	Donation	4, 000, 000	4, 000, 000
Mammoth Cave National Park	6, 521. 04	89, 648. 45	1, 623, 530	Donation	4, 000, 000	4, 000, 000
Manassas National Battlefield Park				Donation	1, 577, 930	1, 577, 930
Mount Rushmore Memorial				do	40, 486, 380	40, 486, 380
Natchez Trace Parkway				(Transfer)	521, 840	521, 840
Olympic National Park				do	136, 100	136, 100
Petersburg National Military Park				Donation	1, 465, 510	1, 465, 510
Petrified Forest National Monument				do	5, 126, 221	5, 126, 221
Rocky Mountain National Park	600. 00		2, 690	do	36, 000	36, 000
Shenandoah National Park				Exchange	12, 760	12, 760
Vicksburg National Military Park	2, 500. 00		160, 000	Donation	2, 563, 380	2, 563, 380
		2, 001. 00	212, 100	do	428, 000	428, 000
				do	11, 510	11, 510

1 2,483.31 acres were purchased and 2,394.80 acres were eliminated by exchange, resulting in a net gain of 88.510 acres.

TABLE 1.—Holdings acquired for national park and monument purposes—Continued

Federal park system	Holdings acquired from July 1, 1939, through June 30, 1940						
	Holdings acquired by purchase			Holdings acquired otherwise than by purchase		Total acquired in acres	Holdings acquired prior to July 1, 1939, in acres
	Government funds	Donated funds	Area in acres	How acquired	Area in acres		
White Sands National Monument.....				Exchange.....	1,793.330	1,793.330	6,044.280
Whitman National Monument.....				Donation.....	45.930	45.930	45.930
Yellowstone National Park.....	\$11,640.00		228.000			228.000	2,466.819
Yosemite National Park.....	45,633.50		1,074.490			1,074.490	35,897.230
Acreage acquired in other areas prior to July 1, 1939.....							109,666.416
Total.....	1,317,694.15	\$115,592.91	23,391.746		22,647.300	46,039.046	1,223,813.676

TABLE 2.—Appropriations for Administration, Protection, and Maintenance, Expenditures Therefrom, and Revenues, Fiscal Year 1940

Name of park	Appropriated	Expenditures and obligations	Revenues received
Acadia.....	\$55,000	\$54,141.74	\$282.20
Bryce Canyon.....	20,980	20,852.40	-----
Carlsbad Caverns.....	102,170	99,735.62	322,018.69
Crater Lake.....	85,000	84,504.57	53,442.16
General Grant ¹	23,345	23,374.73	15,980.80
Glacier.....	221,210	214,499.68	42,781.86
Grand Canyon.....	129,200	126,966.02	125,822.65
Grand Teton.....	28,400	28,877.19	10,231.49
Great Smoky Mountains.....	89,400	88,415.91	2,432.73
Hawaii.....	62,000	61,547.84	1,000.79
Hot Springs.....	81,870	73,164.63	38,845.33
Isle Royale.....	20,000	304.16	204.47
Lassen Volcanic.....	53,225	52,768.32	19,774.55
Mammoth Cave.....	-----	-----	1,089.86
Mesa Verde.....	59,715	53,608.44	11,084.77
Mount McKinley.....	29,970	29,262.85	628.33
Mount Rainier.....	156,275	153,932.66	57,655.55
National Capital Parks:			
United States.....	263,200	259,854.80	73,674.76
District of Columbia.....	947,793	943,714.43	28,580.95
Olympic.....	50,000	48,994.56	-----
Platt.....	20,325	20,138.55	59.85
Rocky Mountain.....	98,485	94,415.31	68,074.83
Sequoia.....	131,735	130,447.54	58,462.16
Shenandoah.....	75,460	74,786.94	67,089.60
Wind Cave.....	20,170	21,557.98	10,235.18
Yellowstone.....	463,520	455,053.96	395,526.15
Yosemite.....	335,000	327,005.05	339,000.25
Zion.....	49,220	48,533.05	41,856.07
National Monuments.....	283,515	284,260.66	36,155.31
National Historical Parks and Monuments.....	159,560	157,284.94	26,173.41
National Military Parks, Battlefields, Monuments, and Cemeteries.....	428,860	370,534.28	36,311.50
Manassas National Battlefield Park.....	56,000	-----	-----
Kennesaw Mountain National Memorial Military Park.....	55,000	52,626.58	-----
Boulder Dam National Recreational Area.....	99,730	98,542.79	718.00
National Park Service.....	259,580	257,957.68	-----
Regional Offices.....	34,000	36,015.07	5,288.21
Public Buildings and Grounds.....	² 71,402	65,673.05	-----
General Expenses, National Park Service.....	36,500	33,520.68	-----
Emergency Reconstruction and Fighting Forest Fires.....	40,000	62,599.80	-----
Forest Protection and Fire Prevention.....	120,000	118,444.19	-----
Roads and Trails.....	³ 3,500,000	3,733,853.21	-----
Blue Ridge and Natchez Trace Parkways.....	³ 4,500,000	8,038,369.49	2,976.40
Historic Sites and Buildings.....	24,000	22,114.68	-----
Investigation and Purchase of Water Rights.....	42,000	21,204.38	-----
Mount Rushmore National Memorial Commission.....	175,000	149,275.39	-----
Miscellaneous.....	-----	-----	35,554.77
Total.....	13,557,815	17,092,735.80	1,929,013.63

¹ Made a part of Kings Canyon National Park Mar. 4, 1940.² Excludes \$7,879,560 transferred to "Federal Works Agency."³ Available until expended.

TABLE 3.—Summary of Appropriations for the Administration, Protection, and Improvement of Areas Under the Jurisdiction of the National Park Service, Together With the Revenues Received, for the Fiscal Years 1917¹ to 1940, Inclusive

Year	Department	Appropriation	Revenues
1917	Interior Department.....	\$533, 466. 67	
	War Department.....	247, 200. 00	
1918	Interior Department.....	529, 780. 00	
	War Department.....	217, 500. 00	
1919	Interior Department.....	962, 205. 00	
	War Department.....	50, 000. 00	
1920		1, 012, 205. 00	196, 678. 03
1921		907, 070. 76	316, 877. 96
1922		1, 058, 969. 16	396, 928. 27
1923		1, 533, 220. 00	432, 964. 89
1924		1, 579, 520. 00	513, 706. 36
1925		1, 759, 601. 00	663, 886. 32
1926		3, 027, 657. 00	670, 920. 98
1927		3, 258, 409. 00	826, 454. 17
1928		3, 933, 920. 00	703, 849. 60
1929		4, 874, 685. 00	808, 255. 81
1930		4, 771, 515. 00	849, 272. 95
1931		7, 890, 321. 00	1, 015, 740. 56
1932		15, 289, 435. 00	940, 364. 79
1933		9, 595, 250. 00	820, 654. 19
1933-40		10, 820, 620. 00	628, 182. 06
1934		47, 513, 764. 89	
1935		8, 957, 976. 00	731, 331. 80
1936		12, 663, 541. 38	907, 189. 96
1937		18, 830, 280. 00	1, 136, 533. 68
1938		17, 595, 805. 00	1, 398, 691. 66
1939		22, 590, 260. 00	1, 504, 561. 84
1940		26, 959, 977. 29	1, 567, 333. 70
		13, 557, 815. 00	1, 929, 013. 63

¹ For summary of appropriations and revenues prior to 1917, see 1920 Annual Report, p. 359.

² The revenues from the various national parks were expendable during the years 1904 to 1918, inclusive, with the exception of those received from Crater Lake, Mesa Verde, and Rocky Mountain National Parks, the revenues from which were turned into the Treasury to the credit of miscellaneous receipts.

TABLE 4.—Forest-fire statistics, 10-year record, Jan. 1, 1930, to Dec. 31, 1939

	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	10-year total	10-year average
Fire occurrence by size:												
Class A fires ($\frac{1}{4}$ acre or less).....	102	193	125	176	205	246	311	228	253	342	2,181	218
Class B fires (between $\frac{1}{4}$ acre and 10 acres).....	45	63	61	59	108	150	302	114	124	143	1,169	117
Class C fires (over 10 acres).....	13	64	35	42	66	41	120	45	39	70	535	53
Total class A, B, and C fires.....	160	320	221	277	379	437	733	387	416	555	3,885	388
Fire occurrence by causes:												
Campfires.....	25	58	26	28	23	32	26	28	28	22	296	30
Smokers.....	50	85	62	78	115	119	171	121	125	188	1,114	111
Debris burning.....	11	56	27	24	35	43	72	31	37	46	382	38
Incendiary.....	2	45	24	31	51	90	247	53	84	57	674	67
Lumbering.....	1	2	2	1	2	2	3	1	2	2	13	1
Railroads.....	1	3	1	3	1	4	4	2	7	17	39	4
Miscellaneous.....	13	15	16	14	24	30	32	23	20	30	217	22
Total man-caused.....	101	259	156	179	251	320	555	259	303	362	2,745	274
Total lightning.....	59	61	65	98	128	117	178	128	113	193	1,140	114
Grand total.....	160	320	221	277	379	437	733	387	416	555	3,885	388
Total number of park visitors	3,246,656	3,544,856	3,754,596	3,481,590	6,337,206	7,676,490	9,929,432	11,635,181	13,176,619	15,500,000	78,282,626	7,828,263
Number of visitors per fire started	43,288	24,789	42,666	32,845	45,921	50,838	50,403	78,359	86,121	73,809	-----	52,904
Total cost of fire fighting (exclusive	\$28,843	\$176,855	\$19,109	\$23,959	\$33,420	\$37,494	\$92,373	\$4,944	\$2,207	\$44,093	\$463,477	\$46,348
of C. C. C.)					44,359	29,326	30,047	7,417	3,293	22,230	138,652	\$ 23,652
C. C. C. man-days contributed												
Area burned inside parks:												
Forest.....	3,248	23,313	4,181	4,777	4,545	1,861	11,847	688	344	2,099	56,993	5,690
Brush.....	407	2,877	182	219	2,101	498	220	13	9	109	6,635	663
Grass.....	687	1,346	180	116	550	343	3,974	871	926	712	9,705	971
Total.....	4,342	27,536	4,543	5,112	7,196	2,702	16,041	1,572	1,279	2,920	73,243	7,324
Average acreage per fire.....	27	86	20	18	31	6	462	21	3	5	18	18
Total area needing protection.....	6,241,074	6,407,048	6,502,074	6,902,319	7,451,060	7,451,060	7,648,462	7,838,914	8,212,978	9,100,000	-----	7,377,500
Area burned per million acres pro-	695	4,297	698	741	966	362	2,097	200	155	321	-----	989
ected.....												

1 Exclusive of visitors to miscellaneous memorials and areas with little or no fire hazard.
 2 6-year average.

TABLE 5.—Interpretive Contacts Recorded Under the Naturalist Program

	Guided Trips		Lectures		Attended stations		Unattended Stations		Total Con- tacts	Total Visi- tors
	Number	Attend- ance	Number	Attend- ance	Num- ber	Attend- ance	Num- ber	Attend- ance		
NATIONAL PARKS										
Acadia.....	110	3,838	82	12,131	3	42,829	0	0	58,798	10,795
Bryce Canyon.....	347	18,116	337	38,159	1	82,950	1	4,971	62,196	227,052
Carlsbad Caverns.....	551	169,925	90	29,674	2	82,480	0	0	282,079	236,999
Crocker Lake.....	188	3,324	588	30,483	3	97,939	3	1,569	133,315	127,979
General Grant.....	39	1,340	56	19,214	0	0	2	14,449	35,003	159,658
Glacier.....	810	18,190	441	33,414	2	114,497	2	72,675	238,776	397,839
Grand Canyon.....	401	25,997	1,360	145,096	3	182,086	4	6,993	360,172	87,387
Grand Teton.....	125	2,337	98	16,587	1	40,407	1	2,383	61,714	11,111
Great Smoky Mountains.....	205	4,404	47	6,482	1	225	0	0	11,111	814,145
Hawaii.....	315	8,322	267	19,553	1	45,015	5	120,800	193,690	252,031
Hot Springs.....	1	85	15	558	1	24,485	1	1,250	26,378	164,214
Lassen Volcanic.....	175	7,035	267	37,425	2	13,629	1	2,400	60,489	99,733
Mount McKinley.....	35	9,753	49	1,448	1	65	0	0	2,266	1,679
Mount Rainier.....	572	9,317	427	27,642	4	193,135	4	24,500	254,594	400,727
National Capital.....	126	4,391	43	21,787	0	0	4	4,450	30,628	615,598
Rocky Mountain.....	303	9,564	394	48,753	3	95,849	1	6,452	160,618	275,225
Sequoia.....	444	12,375	450	116,021	5	56,118	3	87,495	272,009	909,542
Shenandoah.....	22	423	44	3,186	0	0	0	3,609	18,136	18,133
Wind Cave.....	10,996	0	0	0	1	2,150	0	0	13,146	506,604
Yellowstone.....	7,149	80,057	1,840	325,554	6	914,418	5	110,800	1,430,829	506,604
Yosemite.....	652	24,503	1,837	426,350	3	280,393	4	52,800	784,046	511,734
Zion.....	208	11,771	576	88,885	1	9,633	0	0	110,289	162,451
OTHER AREAS										
Boulder Dam.....	193	4,159	757	34,147	5	58,157	0	0	96,463	584,921
Mammoth Cave.....	42	54,740	41	1,595	0	0	0	0	56,335	109,391
Total.....	13,013	485,962	10,106	1,484,144	49	2,254,460	37	513,987	1,738,553	6,673,837
NATIONAL MONUMENTS										
Cedar Breaks.....	14	78	120	2,310	1	6,657	0	0	9,045	15,826
Death Valley.....	27	645	276	22,249	5	9,882	1	8,541	41,317	78,507
Dinosaur.....	1,502	10,595	1,534	18,412	0	0	1	2,578	13,585	13,169
Lava Beds.....	2,012	8,147	9	1,701	3	23,326	3	11,652	44,826	35,548
Lehman Caves.....	429	2,782	0	0	1	238	0	0	3,020	3,629
Muir Woods.....	1,593	30,545	0	0	0	0	2	145,676	176,222	163,198
Oregon Caves.....	13,500	13,500	666	15,380	0	0	3	30,030	30,030	30,236

Petrified Forest.....	563	12,098	994	25,404	1	111,624	1	41,026	190,152	174,820
Timpanogos Cave.....	1,257	12,370	6	226	1	3,529	1	75	16,200	12,182
Total.....	7,397	90,761	3,605	85,682	12	155,256	12	210,698	542,397	527,115
SOUTHWESTERN NATIONAL MONUMENTS										
Arches.....	164	789	1	43	1	25	0	0	857	2,241
Capulin Mountain.....	1	26	1	526	1	1,000	5	548	2,100	29,300
Chiricahua.....	681	3,389	571	2,615	0	0	1	636	6,640	7,817
Natural Bridges.....	147	641	4	32	0	0	0	0	673	677
Organ Pipe Cactus.....	11	48	20	419	2	95	2	34	596	8,910
Saguaro.....	243	808	39	172	1	578	0	0	1,558	15,995
White Sands.....	372	1,834	1,777	10,570	1	7,594	1	589	20,587	37,086
Total.....	1,619	7,535	2,413	14,377	6	9,292	9	1,807	33,011	102,026
Washington and Regional staffs.....	1	54	67	7,464					7,518	
Grand total.....	22,030	584,312	16,191	1,591,667	67	2,419,008	58	726,492	5,321,479	7,302,978

TABLE 6.—Statement Showing Work Accomplished at Civilian Conservation Corps Camps Under the Jurisdiction of the National Park Service July 1, 1939, to June 30, 1940

Item	Unit	Total work accomplished July 1, 1939, to June 30, 1940			
		New construction		Maintenance	
		National parks and monuments	State parks	Combined total national parks and State parks	National parks and monuments
Bridges:					
Foot and horse.....	Number.....	3	63	66	14
Vehicle.....	Number.....	2	36	38	123
Barns.....	Number.....	1	7	8	3
Bathhouses.....	Number.....	2	24	26	-----
Cabins, overnight.....	Number.....	-----	213	213	-----
Combination buildings.....	Number.....	-----	40	40	-----
Dwellings.....	Number.....	56	31	87	131
Equipment and supply storage houses.....	Number.....	30	21	51	24
Garages.....	Number.....	15	28	43	1
Latrines and toilets.....	Number.....	83	149	232	55
Lodges and museums.....	Number.....	4	18	22	7
Lookout houses.....	Number.....	1	-----	1	3
Lookout towers.....	Number.....	3	8	11	11
Shelters.....	Number.....	24	64	88	-----
Other buildings.....	Number.....	62	105	167	343
Cribbing, including filling.....	Cubic yards.....	2, 100	12, 327	14, 427	-----
Impounding and large diversion dams.....	Number.....	2	10	12	1
Fences.....	Rods.....	13, 620.3	42, 346.4	55, 966.7	15, 222.3
Guard rails.....	Rods.....	1, 418.3	12, 944.7	14, 363	570
Levees, dykes, jetties, and groins.....	Cubic yards.....	19, 511	90, 915	110, 426	-----
Power lines.....	Miles.....	28	46.2	74.2	38.3
Incinerators.....	Number.....	7	45	52	2
Sewage and waste disposal systems.....	Number.....	65	311	376	118
Telephone lines.....	Miles.....	177.1	180.2	357.3	1, 023.6
Fountains, drinking.....	Number.....	14	182	196	-----
Pipe or tile lines.....	Linear feet.....	221, 354	381, 938	603, 292	32, 646
Storage facilities (omit last 000)	Gallons.....	566.7	11, 370	11, 936.7	-----
Wells, including pumps and pump-houses.....	Number.....	6	49	55	-----
Miscellaneous.....	Number.....	4	32	36	3
Camp stoves or fireplaces.....	Number.....	358	1, 729	2, 087	-----
Cattle guards.....	Number.....	2	16	18	-----
Corrals.....	Number.....	-----	3	3	1
Seats.....	Number.....	-----	355	355	-----
Signs, markers, and monuments.....	Number.....	5, 820	5, 507	11, 327	2, 572
Stone walls.....	Rods.....	510.5	1, 782.4	2, 292.9	1, 550
Table and bench combination.....	Number.....	530	3, 548	4, 078	13
Tool boxes.....	Number.....	53	60	113	-----
Miscellaneous structures.....	Number.....	284	6, 164	6, 448	16
Radio stations.....	Number.....	5	-----	5	21
Springs.....	Number.....	10	7	17	1
Small reservoirs.....	Number.....	3	10	13	16
Landing docks and piers.....	Number.....	303	20	323	3
Airplane landing fields.....	Number.....	-----	-----	-----	1
Truck trails or minor roads.....	Miles.....	99.5	296.8	396.3	2, 210.5
Foot trails.....	Miles.....	33.5	102.9	136.4	393.8
Horse or stock trails.....	Miles.....	74.4	74.9	149.3	2, 085.8
Stream and lake bank protection.....	Square yards.....	11, 300	255, 183	266, 483	15
Bank sloping.....	Square yards.....	147, 742	254, 824	402, 566	944, 230
Check dams:					
Permanent.....	Number.....	127	758	885	-----
Temporary.....	Number.....	3, 747	2, 125	5, 872	-----
Seeding and sodding.....	Square yards.....	33, 784	394, 196	427, 980	283, 109
Tree planting, gully.....	Square yards.....	185, 450	218, 240	403, 690	-----
Ditches, diversion.....	Linear feet.....	1, 445	20, 308	21, 753	3, 000
Terracing.....	Miles.....	0.6	1	1.6	-----
Channel construction.....	Linear feet.....	-----	80	80	-----
Wind-erosion area treated.....	Acres.....	-----	14	14	-----
Water spreaders (rock, brush, wire).....	Linear feet.....	-----	5, 606	5, 606	-----
Channels and levees, clearing and cleaning.....	Square yards.....	3, 375	32, 907	36, 282	-----
Reservoir, pond, and lake sites—clearing.....	Acres.....	70	550.2	620.2	-----
Excavating channel, canals, and ditches:					
Earth.....	Cubic yards.....	60, 000	1, 079, 760	1, 139, 760	-----
Rock.....	Cubic yards.....	4, 500	1, 510	6, 010	-----

TABLE 6.—Statement Showing Work Accomplished at Civilian Conservation Corps Camps Under the Jurisdiction of the National Park Service July 1, 1939, to June 30, 1940—Continued

Item	Unit	Total work accomplished July 1, 1939, to June 30, 1940			
		New construction		Maintenance	
		National parks and monuments	State parks	Combined total national parks and State parks	National parks and monuments
Pipe and tile lines and conduits	Linear feet	19,525	48,476	68,001	-----
Rock or concrete—riprap	Square yards	22,085	42,191	64,276	-----
Brush or willows—riprap	Square yards	11,088	1,000	12,088	-----
Water control structures other than dams	Number	1,069	1,044	2,113	-----
Field planting or seeding (trees)	Acres	4,312.7	1,957.5	6,270.2	4,723.2
Forest stand improvement	Acres	20	60.3	80.3	-----
Nurseries	Man-days	22,752	50,980	73,732	9,356
Tree seed collection, conifers (cones)	Bushel	28	2,288	2,316	-----
Tree seed collection, hardwoods	Pounds	43,165	29,772	72,937	-----
Collection of tree seedlings	Number	-----	93,991	93,991	-----
Fighting forest fires	Man-days	40,192	38,097	78,289	-----
Fire breaks	Miles	11.5	62.2	73.7	45.7
Fire hazard reduction:					
Roadside and trailside	Miles	103.9	219.4	323.3	-----
Other	Acres	4,029.5	22,957.4	26,986.9	-----
Fire presuppression	Man-days	69,989	108,086	178,075	-----
Fire prevention	Man-days	511	2,025	2,536	-----
Tree and plant disease control	Acres	18,670.3	6,522	25,192.3	237
Tree insect pest control	Acres	33,418.8	69,488	102,906.8	7,080
Beach improvement	Acres	51	178	229	53
General clean-up	Acres	22	-----	22	-----
Landscaping, undifferentiated	Acres	1,892.7	2,372.8	4,265.5	461.4
Moving and planting trees and shrubs	Number	364,649	1,410,692	1,775,341	261,890
Parking areas and parking overlooks	Square yards	44,415	699,963	744,378	97,850
Public camp-ground development	Acres	219.1	246.4	465.5	778.5
Public picnic-ground development	Acres	24.2	528.4	552.6	165.2
Razing undesired structures and obliteration	Man-days	62,071	153,094	215,165	-----
Seed collection (other than tree)	Pounds	176	1,039	1,215	-----
Seeding or sodding	Acres	607.8	711.6	1,319.4	2,984.2
Soil preparation	Acres	1,842.4	521.7	2,364.1	-----
Vista or other selective cutting for effect	Acres	540.7	1,252.8	1,793.5	-----
Walks; concrete, gravel, cinder	Linear feet	33,887	54,236	88,123	6,920
Range revegetation	Acres	692	-----	692	-----
Fish rearing ponds	Number	1	13	14	63
Food and cover planting and seeding	Acres	-----	41	41	-----
Lake and pond development	Man-days	1,512	41,335	42,847	-----
Stocking fish	Number	1,382,760	30,000	1,412,760	-----
Stream development (wildlife)	Miles	4	2	6	-----
Other wildlife activities	Man-days	11,373	13,046	24,419	154
Wildlife feeding	Man-days	24	1,749	1,773	-----
Wildlife shelters	Number	-----	352	352	-----
Education, guide, contact station work	Man-days	57,168	23,473	80,641	-----
Emergency work	Man-days	15,224	49,497	64,721	-----
Eradication of poisonous weeds or exotic plants	Acres	451.4	1,913.5	2,364.9	-----
Experimental plots	Number	31	43	74	26
Insect pest control	Acres	-----	8,664	8,664	-----
Maps and models	Man-days	3,535	2,086	5,621	-----
Marking boundaries	Miles	604	190.6	494.6	-----
Mosquito control	Acres	25	195	220	-----
Preparation and transportation of materials	Man-days	172,321	369,099	541,420	-----
Reconnaissance and investigation:					
Archaeological	Man-days	9,564	10,204	19,768	-----
Other	Man-days	4,703	13,128	17,831	-----
Restoration of historic structures	Number	163	11	174	-----
Surveys	Man-days	23,473	66,568	90,041	-----
Tree preservation	Man-days	14,549	25,685	40,234	-----
Equipment, repair, or construction	Man-days	3,277	3,861	7,138	-----
Hydraulic research	Man-days	61	2,841	2,902	-----
Warehousing	Man-days	4,439	8,518	12,957	-----
Technical service camp buildings	Number	31	86	117	4
Central repair shop labor	Man-days	12,462	11,502	23,964	-----
Unclassifiable	Man-days	272	260	532	-----

OFFICE OF DIRECTOR OF FORESTS

Lee Muck, *Director*

THE Department of the Interior, established in 1849, was the first Executive Department of the United States with administrative responsibilities in forestry. Long before the creation of the first National forest reserve in 1891 and the granting of authority to administer the National forest reserves in 1897, different bureaus and offices of the Department put forth special efforts to protect and promote the interests of the Federal Government in the forests of the public domain and on other Federal lands. Ever since 1850, when the first Federal timber agents were appointed, but especially following the reorganization and enlargement of the whole timber-agent system in 1877, forest administration has been one of the principal functions of the Department of the Interior.

The practice of forestry in the Department has progressed through the use of special programs designed for application to such diversified forest conditions as exist on the public domain, the National parks and on Indian lands. Because of the highly diversified conditions which characterize these lands the Department of the Interior carries on a wider range of forestry functions and activities than any other Federal Department; and highly significant also is the fact that under its jurisdiction at the present time is almost two-thirds of the area of all Federal lands in the United States proper, and if Alaska is included, then its jurisdiction extends over almost three-fourths of all Federal lands.

NATIONAL DEFENSE

The forest resources under the jurisdiction of the Department are so strategically situated and so well developed as to make substantial contributions to the National defense. These resources were under development during the World War and contributed in full measure to the prosecution thereof. They are in a position to furnish large volumes of essential forest products during the existing emergency and the administrative units in charge of development are being so organized as to meet any increase in demand which may develop.

CUSTODIAN OF VAST LAND AREAS AND DIVERSE FOREST RESOURCES

The vast land areas under the jurisdiction of the Department of the Interior—approximately 268,000,000 acres in the United States proper—occur in all parts of the country but chiefly in the West. The condition of these lands is far more variable than that of any other Federal lands—ranging all the way from bare desert to primeval forests and from practically worthless waste areas to priceless masterpieces of Nature's best productions. This wide range of conditions has resulted in a correspondingly wide range of aims and purposes in the administration of these resources and requires the application of highly diversified policies and practices.

Most of the forest lands managed by the Department of the Interior were set aside for specific purposes by definite congressional enactments. The objectives set forth in the creating legislation vary from the preservation of the forests in their natural condition, as is the case in National parks, to the commercial handling of forests, including logging, as is the rule on Indian lands and the revested and reconveyed Federal forest lands in western Oregon. The Department thus finds itself the custodian of vast land areas which divide themselves quite naturally and readily into several categories of permitted land use, each category being administered by and under the jurisdiction of a separate office, bureau, service, or administration—all coordinated and directed by a Director of Forests in the Office of the Secretary of the Interior.

REPORT TO THE JOINT CONGRESSIONAL COMMITTEE ON FORESTRY

In a message to the Congress dated March 14, 1938, the President recommended the appointment of a committee to study the forest situation in the United States with a view to providing a basis for the enactment of essential legislation in the field of forest conservation. This message led to the approval by the Congress on June 14, 1938, of Joint Congressional Resolution No. 31 which established a Joint Committee on Forestry. The Committee held public hearings throughout the United States and has assembled an exhaustive record covering the forestry problems of the Nation.

Inasmuch as the Department of the Interior is charged with the care of the forests and forage on approximately 267,000,000 acres of public land in the continental United States, its activities in the field of conservation are of material importance as affecting a balanced timber budget and the concomitant influences of timber and forage growth. Accordingly, with a view to being helpful to the Joint Con-

gressional Committee on Forestry a complete report was compiled by the Department covering its conservation policies, programs, and practices and submitted to the chairman of the committee under date of February 27, 1940. The major recommendations contained in the report were as follows:

1. Enact legislation authorizing the establishment of Indian forest reserves and providing for the administration thereof under principles of cooperative sustained-yield forest management.

2. Enact legislation authorizing the administration of unreserved public domain lands, intermingled with and lying adjacent to the O. & C. lands under principles of cooperative sustained-yield forest management.

3. Enact legislation authorizing the sale of forest products from areas within grazing districts under appropriate rules and regulations.

4. Provide increased funds for the protection of the lands administered by the Department—particularly the O. & C. grant lands, the remaining unreserved lands of the public domain, the National parks, and the forests of the interior of Alaska.

5. Provide funds for listing the scattered unreserved public-domain lands not included in grazing districts and for surveying their resources; preparing a map and formulating a plan for the future disposition, exchange, consolidation, and management of these lands.

6. Provide adequate funds for range studies and surveys, range revegetation, and range improvements covering the public lands incorporated in organized grazing districts.

FORESTRY PROBLEMS HANDLED

In addition to completing the compilation of the Departmental report on forestry for the Joint Congressional Committee during the fiscal year 1940, the office of Director of Forests discharged its regular responsibilities covering the coordination of the activities of the several divisions of the Department which are concerned with forest management. Marked progress was made in perfecting the organization of the O. & C. grant lands; a large volume of Indian forestry business was handled; two important Indian timber damage suits were brought to a successful conclusion; contributions were made to the Forest Industries Conference of which the Director is the chairman; much assistance was rendered to the land committee of the National Resources Planning Board; and advisory services were given on a large number of cases and problems to the various agencies of the Department charged with administrative responsibility in forest conservation.

A review of the constructive results attained during 1940 and a consideration of the advances made by the Department in the field of forest management, provides complete justification for the establishment of the Office of Director of Forests. In no other Federal department is there so great a diversity of forestry work,

ranging all the way from absolute forest preservation in the National parks to intensive timber development operations on Indian lands and the revested and reconveyed Federal lands of western Oregon. However, in spite of this diversity in objectives and activities much has already been accomplished in effecting a close cooperation of all agencies dealing with forestry and in securing a comparatively high level of effective business management.

BUSINESS MANAGEMENT

It is the policy of the Department of the Interior to make the management of its industrial forests models of economy and good business. In fact, the administration of Indian forests and the revested and reconveyed forests of western Oregon has always been conducted well within income.

A consideration of the results of operations on Indian forests for the period 1910 to 1939, inclusive, discloses a gross income of \$46,142,780. The cost of administration and protection during the same period totaled \$7,542,900, thereby reflecting an average ratio of cost to income of approximately 16 percent. The total income from Indian forest and range lands during the fiscal year ended June 30, 1940, was \$2,718,397 and the cost of administration and protection was \$501,500, reflecting an operating coefficient of approximately 18 percent.

The income from the sale of timber on the O. and C. grant lands for the period 1918 to 1939, inclusive, was \$10,250,150 and the cost of administration and protection during this same period averaged less than 3 percent thereof. Subsequent to the enactment of the act of August 28, 1937 (50 Stat. 874) administrative costs have increased materially by reason of the application of a policy of sustained-yield forest management. However, there has been an increase in revenues and costs are constrained by law to 25 percent of the income.

According to the report of the Chief Forester, receipts for the fiscal year ended June 30, 1940, totaled \$852,647 and the cost of administration and protection was \$160,000, thereby reflecting a ratio of cost to income of approximately 18 percent or less than the operating coefficient provided by the 1937 act.

The operating relationships revealed in the foregoing analyses furnish convincing evidence that the industrial forests under the jurisdiction of the Department of the Interior are being managed on a sound business basis. It should be pointed out, however, that the funds being made available for the administration of these substantial revenue producing projects are not sufficient to attain the

high degree of effectiveness which is warranted; that a more intensive management of these forests would be of inestimable value to the Nation and would make possible a substantial increase in the revenues received.

FOREST PROTECTION

The protection organizations of the National Park Service, the Indian Service, and the O. and C. Administration functioned effectively during the fiscal year 1940. Weather conditions were comparatively unfavorable and a large number of fires were suppressed. However, losses were held at a remarkably low level, when consideration is given to the limited funds being made available for the protection of Interior Department forests.

For the first time in the history of the Department funds were provided for the protection of the interior forests of Alaska during 1940. Although the \$37,500 made available was wholly inadequate, an efficient protection unit, supplemented by the C. C. C., was organized and marked progress made in fire prevention and suppression.

The effective protection of the forests of Alaska is a matter of grave concern from the standpoint of National defense and by reason thereof an earnest effort was made to secure a substantial increase in the appropriation for the year 1941. However, the amount authorized for this purpose was reduced to \$27,000 and as a result the organization will be seriously handicapped during the current fiscal year in spite of the increased demand upon its services which have developed with the existing emergency.

PETROLEUM CONSERVATION DIVISION

George W. Holland, Director

THE Petroleum Conservation Division was established to assist the Secretary of the Interior in administering the Act of February 22, 1935 (49 Stat. 30), as amended, the so-called Connally law; to cooperate with the Interstate Oil Compact Commission and the oil- and gas-producing States in the prevention of waste in oil and gas production and in the adoption of uniform oil- and gas-conservation laws and regulations; and to keep informed currently as to the movement of petroleum and petroleum products in interstate commerce in order to be in position to report to the President a lack of parity between the supply of and the consumptive demand for petroleum and petroleum products.

The Connally law was to have expired June 30, 1939, but by an act of Congress approved June 29, 1939, it was extended to June 30, 1942. This law regulates interstate and foreign commerce in petroleum and petroleum products by prohibiting shipment in such commerce of petroleum and its products produced in violation of State law. By Executive Order petroleum or petroleum products shipped from Louisiana or Texas ports are required to be reported. Likewise, the discharge of these cargoes in the United States is required to be reported. During the fiscal year, approximately 13,500 shipments were reported to the Division.

OPERATIONS IN THE EAST TEXAS AREA

Federal Tender Board No. 1 operates in a designated area known as the East Texas oil field and is required upon application to issue certificates of clearance, or tenders, permitting the shipment in interstate commerce of petroleum or petroleum products whenever it determines that the petroleum or petroleum products do not constitute contraband oil as defined in the act.

During the fiscal year 4,044 applications for tenders, of which 2,854 were for 185,113,582 barrels of crude oil, 195 for 114,610 barrels of scrubber oil, and 995 for 19,667,112 barrels of products, were received. At the beginning of the period there were pending 12 tenders for crude oil, one for scrubber oil, and one for products. At the end of the period there were pending 7 tenders for crude oil and one for

products; consequently, the Board took action on 4,050 tenders. It did not approve 48 tenders for crude oil amounting to 102,466 barrels and 3 tenders for products amounting to 3,346 barrels and before approval it reduced tenders for crude oil 1,078,828 barrels and for products 21,823 barrels. The aggregate quantity of petroleum approved for shipment in interstate commerce was substantially larger than that actually produced in the East Texas field, owing to the re-tendering monthly of legally produced oil held in storage and oil previously tendered but not shipped, the approval of tenders covering oil produced elsewhere but received in the East Texas area, and the issuance of tenders on oil interchanged between companies operating in the area.

The allowable production for East Texas during the fiscal year was 142,202,501 barrels of which 139,555,087 barrels or more than 98 percent was reported to the Board. During the fiscal year the reported production from leases was 139,267,471 barrels which with changes in stocks and other internal field movements made available 140,339,148 barrels of East Texas crude; of this 135,478,606 barrels, or 96.54 percent, moved directly from the field by pipe lines (135,400,865) and railroads and trucks, and 4,552,120 barrels, or 3.24 percent, moved to refineries located within the field.

There were 25,829 producing oil wells in the East Texas field on June 30, 1940, which was 29 less than the same time last year even though 264 wells were completed during the year. The average density of the field was increased from one well per 5.1 acres on June 30, 1939, to one well per 5.09 acres on June 30, 1940. Fewer wells were drilled in the East Texas field during the year than in any other year of its history and correspondingly the well density was more nearly stationary. The average bottom hole pressure declined from 1,085.08 pounds per square inch in June 1939, to 1,059.61 as of June 1940, a decrease of 25.47 pounds compared with a decline of 35.76 pounds last year. An average of nearly 5,500,000 barrels of crude oil was produced for each pound of decline in reservoir pressure as compared with approximately 4,000,000 barrels for the preceding year.

Fifteen natural gasoline plants, which were connected to an average of 24,296 wells, reported operations to Federal Tender Board No. 1 during the fiscal year. These plants processed 45,538,787,000 cubic feet of lease and still gas and manufactured a total of 7,081,533 barrels of products. This represents an average of 6.53 gallons of natural gasoline, butane and propane, per thousand cubic feet of well gas processed as compared with 6.09 the previous fiscal year. The average monthly production of gas per well was 155.54 thousand

cubic feet and the average gas-oil ratio of the 24,296 wells connected to reporting gasoline plants was 336.40 cubic feet per barrel of oil.

Summary of East Texas Refinery Operation,¹ 1940 Fiscal Year

	Barrels	Percent
East Texas crude to stills.....	4, 291, 259	99. 49
Other Texas crude to stills.....	22, 111	. 51
Total.....	4, 313, 370	100. 00
Products manufactured:		
Gasoline and naphthas.....	2, 648, 393	61. 19
Kerosene.....	262, 054	6. 06
Gas oil and distillates.....	99, 587	2. 30
Fuel oil.....	1, 019, 236	23. 55
Unfinished oils.....	35, 059	. 81
Losses in refining.....	263, 574	6. 09
Total.....	4, 327, 903	100. 00

¹ Reporting to Federal Tender Board No. 1.

EXAMINATIONS OUTSIDE THE EAST TEXAS AREA

An office for the investigation of alleged Connally law violations was opened in New Orleans, Louisiana, on July 14, 1939, and a similar office was opened on August 21, 1939, in Lansing, Michigan. The Houston, Texas, office was continued throughout the year. Among the miscellaneous investigations of Federal Tender Board No. 1 authorized by the Secretary of the Interior outside the East Texas area were those of Kansas and Arkansas.

SPECIAL INVESTIGATIONS AND LITIGATION

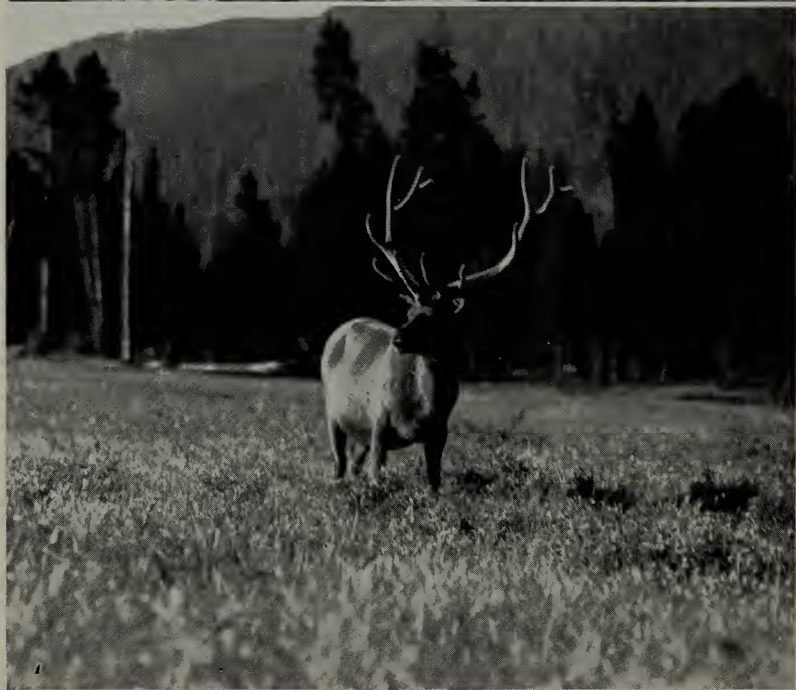
During the period since March 1, 1935, more than 2,000 special investigations have been made of alleged violations of the Connally law, of which about 1,500 did not justify setting up criminal case files. The number of alleged criminal cases investigated and reported was 572, of which 125 have been prosecuted with 121 convictions. Fines assessed and bonds forfeited have totaled \$231,100 of which \$50,000 was assessed during the fiscal year. In addition to fines, 118 defendants have received suspended sentences of from 30 days to 18 months. Action in 424 cases was consolidated with other cases or suspended for lack of adequate evidence. At the close of the fiscal year 12 criminal and civil cases were pending in the courts and 11 cases were under investigation.

COST OF ADMINISTRATION

The administration of the Connally law is essentially a field activity. Of the 74 persons employed at the close of the fiscal year, 60 were in the field and 14 in Washington.

The following table shows the expenditures made of available funds:

Personal Services:		<i>Appropriation</i>
Petroleum Conservation Division	-----	\$41,261
Federal Tender Board No. 1	-----	180,037
Total	-----	<u>221,298</u>
Miscellaneous:		
Materials and supplies	-----	9,677
Communications	-----	2,786
Travel	-----	13,084
Transportation of things	-----	406
Printing and binding	-----	1,608
Rent of buildings	-----	7,648
Equipment	-----	2,327
Total	-----	<u>37,536</u>
Total obligated	-----	258,834
Unobligated	-----	<u>1,166</u>
Total funds available	-----	260,000



CONSERVATION PROTECTS NATION'S WILDLIFE.

Upper: This mallard is one of more than 3,700,000 North American birds banded since 1920 by Biological Survey officials and cooperators to study migrations and ranges.

Lower: The majestic elk still reigns. Latest estimates compiled by the Biological Survey and its cooperators indicate there are more than 232,000 elk in 24 States.

BUREAU OF BIOLOGICAL SURVEY ¹

Ira N. Gabrielson, *Chief*

INTRODUCTION

WILDLIFE in the United States was in a much better condition with reference to human requirements at the end of the fiscal year 1940 than at the beginning. For a bureau charged with the responsibility of national wildlife administration this satisfactory report would in most years be self-sufficient evidence that the agency was contributing to the national welfare. At a time, however, when nearly all undertakings are being judged in terms of defense against external aggression and internal subversion and when past experience indicates the need for caution against a perversion of patriotic zeal that may even endanger some of the important endowments of what must be defended, a more explicit evaluation of wildlife-restoration progress in terms of social welfare and national solidarity seems essential. In other words, it should be pointed out that the United States is better able to undertake an intensive national-defense program because of the success thus far achieved in restoring and conserving its wildlife and, further, that a continuing wise administration of this natural resource will strengthen a nation's defense against both foreign and domestic dangers.

Conservation—or prudent use—of wildlife is one way of making a country worth living in, a first essential in inspiring zealous defense. An abundant wildlife, in other words, is an added attraction to the outdoors, and outdoor experiences foster the qualities of character that are reflected in the American way of living, a heritage that must be defended. Thus wildlife conservation not only contributes toward defense against subversive tendencies but also develops a national morale that will withstand the stress of any emergency requiring action against forces from without.

Though intangible, this fundamental contribution is continuous and thorough rather than temporary or sporadic. Inconspicuous at any

¹The fifty-fifth annual report of this organization is both its first to the Secretary of the Interior and its last as the Bureau of Biological Survey; in accordance with the President's Reorganization Plan No. II the Survey was transferred from the Department of Agriculture to the Department of the Interior on July 1, 1939; and by Reorganization Plan No. III it was merged with the Bureau of Fisheries on June 30, 1940, to form the Fish and Wildlife Service.

given time and perhaps even overlooked by many during emergencies, the benefits of wildlife conservation are long-time benefits. They will be as important in future requirements for good living and future national emergencies as they are at present. If a high type of conservation is not maintained consistently, the Nation may suffer losses that will be difficult to make up and will impair good living for many years thereafter. Conservation of wildlife in the United States would not in any presently conceivable emergency be consistent with any unusual inroads into the resource, either for meat supplies or for protection against theoretically serious crop losses.

The Biological Survey in administering wildlife has not only encouraged desirable birds and mammals but for many years has also taken the leadership in an intelligent restraint of the numbers of such species as do damage. Carnivorous animals that prey on livestock, rodents that destroy crops or food supplies, carry disease, and by their burrows damage irrigation and other embankments, and birds that prove destructive in orchards and grainfields are being controlled more effectively than ever before as a result of the operations and demonstrations of the Survey. These activities will take on new significance during a national emergency in which food supplies become of critical importance. They can be intensified to any needed degree, yet here too it will be important to exercise due caution, as World War experience indicates that demands for unwise destruction of desirable birds may at such a time be made in the supposed interests of food production. Control activities should never go beyond the demonstrated need.

Personnel and facilities of this agency will be available whenever needed by the Nation for a supreme effort. The field force throughout the country, which is unusually familiar with geographical features, in emergencies could protect areas where damage might impair transportation or weaken defenses. The well-organized and capable body of men engaged in enforcing the Federal laws that protect wildlife could undoubtedly assist in anti-espionage and other under-cover work. Yet it seems important to emphasize that in general the greatest service that this agency can perform during a national emergency is to continue to conserve wildlife as an invaluable natural resource that is at all times essential to the national welfare.

Wildlife conditions in the United States are not yet what they should be everywhere. Those that are favorable are the result of years of planning and carrying out corrective measures that were sorely needed after unwise exploitation. Only in recent years has there been a definite and well-implemented national program to restore and conserve wildlife. In the 55 years since its beginning as a

small unit of three employees concerned with research in economic ornithology, the Biological Survey at the time of its merger with the Bureau of Fisheries at the close of the year had developed into an action as well as a research agency and had become the instrument of a strong national purpose to administer wildlife resources intelligently. The final year of its separate existence was a climax of accomplishment, and its enlarged opportunities as part of the Fish and Wildlife Service are faced with confidence and enthusiasm.

ORGANIZATION CHANGES

The fiscal year 1940 was characterized largely by efforts to improve efficiency by perfecting governmental organization for carrying on conservation activities, the actual work being in the main a continuation of programs already under way looking toward the ultimate objective of sound wildlife restoration. On the first day of the fiscal year the Biological Survey became a part of the Department of the Interior, entering into closer cooperation with other agencies of the Department, including the Bureau of Fisheries, which had simultaneously been transferred to it from the Department of Commerce. A continuance of cooperation with agencies of the Department of Agriculture on matters related to wildlife was agreed to by a formal memorandum.

During the course of the fiscal year the Food Habits research laboratory, after 55 years in Washington, D. C., was transferred to new quarters at the Patuxent Wildlife Research Refuge, Md. Under authority of Reorganization Plan No. II, the Secretary directed the transfer of the Wildlife Division of the National Park Service to the Biological Survey, which became effective on January 1, 1940. Plans also were completed for a reorganization of field work in the United States, the nine regions being rearranged into five. On the last day of the year, in accordance with the President's Reorganization Plan No. III, the consolidation of the Biological Survey and the Bureau of Fisheries to form the Fish and Wildlife Service became effective. Through these changes the Federal Government enters the fiscal year 1941 better organized than ever before to carry on the work of wildlife restoration.

OTHER EVENTS OF THE YEAR

The outstanding events of the year in connection with programs and policies already under way may be summarized as follows:

Research on Game Birds

Canada goose studies.—Investigations of Canada geese and the factors influencing their increase were conducted in Utah, Oregon, and

California, and studies of their feeding habits were made in the Great Basin and in the Northwest.

Experiments in marsh burning.—On the Sabine and Lacassine Refuges, La., experimental burning of marshes indicated that fire is an important tool in management for geese, as an estimated 500,000 geese were attracted to these refuges after the burning.

Industrial operations in wildlife habitat.—Studies were made of wildlife problems on the Santee-Cooper Power and Navigation Project in South Carolina for safeguarding a major winter-concentration area for waterfowl and an ideal river-bottom and forest habitat for one of the purest strains of wild turkey in eastern North America.

Mosquito control and waterfowl habitat.—A detailed experimental project was set up at the Bombay Hook Refuge, Del., and gratifying results were obtained in demonstrating control of salt-marsh mosquitoes with minimum injury to waterfowl habitat.

Quail-nutrition studies.—In investigations on bobwhites, the nutritive value and palatability of several native quail foods were studied and it was developed that common salt is a valuable aid in combating cannibalism among both growing and adult birds.

Fur-Production Investigations

Disposal of Federal furs.—A unified policy was established for handling and disposing of all furs that become the property of the Bureau.

Import quota on foxes.—Largely through cooperation with fur farmers and Federal agencies, an import quota on silver foxes was established, thus preventing the dumping of foreign pelts on the American market and serving to maintain prices paid for silver fox pelts.

Exceptional prices for pelts.—Of unusual interest was the sale of a single Norwegian platinum fox pelt for \$11,000 and an entire lot of 400 platinum skins for more than \$500 each.

Other Wildlife Studies

New laboratories at Research Refuge.—Completion of the C. Hart Merriam Laboratory (named for the first chief of this agency) made available a three-story structure to house the former in-Washington staff of the Food Habits laboratory, and doubling the size of the Henry W. Henshaw Laboratory (named for the second chief) provided needed facilities for wildlife-disease research. These laboratories and a 3,000-acre wood and cultivated tract make extensive research possible on wildlife problems peculiar to the Eastern States.

Completed catalog of type specimens.—A list with data of the 1,323 mammal type specimens in the Biological Survey collection was completed for publication by the United States National Museum.

Research on elk.—A 10-year research on the American elk was completed, and the manuscript reporting it submitted for publication in the North American Fauna series.

Classification of white-tailed deer.—Research in cooperation with the National Museum on the classification and distribution in North and Middle America of the white-tailed deer, the most important American big-game animal, was completed, and 10 new forms were described.

Discovery of vanishing deer.—A herd of between 500 and 1,000 Pacific white-tailed deer, a subspecies previously supposed to be near extirpation, was discovered and studied.

Marsh-ecology research.—Research conducted during the past two years on the ecology of the marshes and swamps of the Gulf region resulted in the preparation of a technical report on alluvial marshes and swamps of Louisiana.

Refuge food and cover studies.—Surveys of wildlife refuges were made to note the relation of native and propagated food and cover plants and animal communities and populations to wildlife welfare and refuge management.

Control methods.—Research developed more effective and selective methods for use in the control of predatory animals and injurious rodents, improved the practices for controlling tree-girdling mice in the Northeastern States, and perfected a method to concentrate the active principle of red squill used in rat control.

Wildlife Restoration

Effectiveness of Federal-aid program.—Experience gained during the first year's Federal aid in wildlife restoration and increased funds enabled the States to undertake wildlife restoration activities more effectively and more extensively, 237 individual projects involving the expenditure of \$2,082,735 having been begun as compared with 58, at a cost of \$343,932, initiated in 1939.

New refuges.—The number of wildlife refuges was increased to 263 and the acreage to 13,635,365; the 3 new refuges were the Susquehanna, Md. (a closed area); the Noxubee, Miss.; and the Bosque del Apache, N. Mex.

Refuges placed under administration.—Eight regular refuges, totaling 1,617,993 acres, were placed under active administration, and 68 easement areas in North Dakota and 4 in Montana were assigned to nearby refuges for administration.

Drainage projects inspected.—Of 202 proposed W. P. A. drainage projects inspected, 150 were approved by the Bureau, 15 disapproved because of adverse effects on wildlife, and 37 approved conditionally.

Refuge revenue.—Income from the sale of surplus big-game animals and other refuge products and for the use of refuge lands totaled \$75,845, of which 25 percent was turned over to the counties in which the refuges are situated and the remainder deposited in the Federal Treasury.

Wildlife increases on refuges.—For the fourth consecutive year, increases were noted all over the country in the wildlife populations using the national wildlife refuges.

Pest Control

Bird damage to crops.—Marked progress was made in determining essential facts regarding damage by certain birds to crops and in working out improved methods and practices for prevention.

Predatory animals.—In safeguarding the Nation's wool and meat supply by protecting livestock, poultry, and game, 116,805 predatory animals were taken in organized control work.

Injurious rodents.—Protection was afforded to agricultural crops, forage and timber resources, soil-conserving structures, and stored food supplies through the treatment under Bureau supervision of 12,174,125 acres infested by injurious rodents and 198,902 premises in rat control.

DISSEMINATION OF WILDLIFE INFORMATION

When transferred from the Department of Agriculture on July 1, 1939, the Bureau ceased to contribute to the various publication series of that Department, other than statistics of hunting stamps and licenses, but continued to disseminate information on wildlife research, conservation, and management in several series of the Department of the Interior, some of them new. Technical reports continue to be issued in the North American Fauna and in a new series of Wildlife Research Bulletins. Popular publications formerly appearing in the Farmers' Bulletin series are now contributed to a new series of Conservation Bulletins of the Department of the Interior and have the same aid of Congressional distribution as was formerly given the Farmers' Bulletins. All other Bureau publications are consolidated in one series of Wildlife Circulars, except posters, annual reports, brief processed Wildlife Leaflets, and the Alaska Game Commission Circulars, which, not being numbered departmental series, remain unchanged.

Continuing other functions of disseminating wildlife information, the Bureau prepared summaries of its findings and announcements of important events for release to the press, and met many demands for special articles in periodicals and for addresses at conventions and meetings. In the radio field it participated in the preparation of national network wildlife programs and assisted in the preparation of a series of 15-minute transcribed radio programs for use by local stations.

To disseminate information through motion pictures it produced three one-reel sound pictures, in both 35-mm. and 16-mm. sizes, on mice in orchards and bears in Alaska; and furnished photographs to writers and publishers for illustrating wildlife-information articles.

The Bureau participated more extensively than previously in the observance of National Wildlife Week, and again took an active part in planning and participating in the North American Wildlife Conference. Members of the technical staff represented the Bureau at other gatherings of scientists and conservationists, and of stockmen, farmers, and others interested in various phases of wildlife research and management, where they had opportunity to present in detail many matters here briefly summarized.

FUNDS AVAILABLE

To finance the work of the Survey for the year a total of \$7,392,524 was available from regular and emergency appropriations. Of this sum, \$3,928,691 was carried in the Agricultural Appropriation Act for regular activities; \$1,111,325 was realized from the sale of Federal migratory-waterfowl hunting stamps; \$820,798 was allocated from the Emergency Relief Appropriation Act of 1939 for water-conservation and wildlife-restoration work, and \$34,216 for related administrative expenses; \$1,293,644 was made available for expenditure in connection with work performed by the C. C. C. on national wildlife refuges; and \$203,850 was allocated by the Public Works Administration for the construction of buildings and other improvements at the Fur Animal Experiment Station, Saratoga Springs, N. Y., and on the Patuxent (Md.) Research Refuge.

RESEARCH ON WILDLIFE STATUS AND MANAGEMENT

THE WATERFOWL SITUATION

Investigations in Canada

Study of the migration of waterfowl in the spring of 1939 substantiated the general accuracy of the preceding January inventory. Nearly 300 carefully picked observers covered the movement and 71

percent noted increased numbers of the birds, compared with the spring flight of 1938. Assured thus of a larger breeding stock, the biologists of the Atlantic, Mississippi, and Central Flyways resumed their investigations on the nesting grounds of Canada, carrying on work in the eastern Maritime Provinces, the eastern Arctic, and the central region, from the international boundary to the Arctic coast. The vast breeding grounds "north of the bush" in central Canada have not been altered by human activity and are found today as satisfactory for nesting waterfowl as when first seen by civilized man. With an adequate stock of birds to populate them fully, they could probably supply, without recruitment from other regions, most of the ducks and geese that at present can be carried through the winter. The evidence demonstrated that the waterfowl population is on an upward trend.

Waterfowl habitats in south-central Canada have been materially improved by the development of small water areas under a program sponsored by the Dominion Government by the passage in 1935 of the Prairie Farms Rehabilitation Act. Appropriations for this purpose totaled \$1,250,000 in 1935, \$1,184,420 in 1936, and \$2,000,000 in 1937, the last year for which figures are available. By July 1939 the Dominion had completed 5,538 "dugouts," 2,388 stock-watering dams, and 568 irrigation projects, a total of 8,494, in addition to more than 200 larger, municipal-community projects. Although only a few of these areas are yet suited to the needs of nesting waterfowl, some were immediately adopted by the birds.

Investigations in Alaska

Indications are that the waterfowl breeding grounds of Alaska are the source of most of the ducks and geese seen in California and other Pacific coast sections, but their great importance has not been fully recognized. The Pacific Flyway biologist made studies of Alaska waterfowl populations and habitats in the valleys of the Yukon, Kuskokwim, Tanana, Innoko, and Iditarod, as well as in those of other rivers of lesser importance, and at the conclusion of work in the twin Yukon and Kuskokwim Deltas, made a reconnaissance north to the delta of the Noatak River, tributary to Kotzebue Sound. The summary of his own observations and of reports of the agents of the Alaska Game Commission and others pointed to a distinct numerical improvement in the geese, swans, and cranes, and indicated that, while the duck population was satisfactory, there were no conspicuous gains over 1938.

Investigations in Mexico

The Central Flyway biologist resumed his winter investigation on the east coast of Mexico south to the head of the Tamiahua Lagoon, while the biologist of the Pacific Flyway was working in the western part of that country from Chihuahua and Coahuila south to Morelos and Guerrero. Although serious drought in eastern Mexico had lowered the levels of coastal lagoons, leaving scores of square miles of mud flats covered with dried aquatic vegetation, the ducks appeared to have no difficulty in finding suitable quarters. The total number wintering in eastern Mexico showed a slight increase over 1938-39, despite varying decreases in the gadwall and the baldpate. Geese in general were present in smaller numbers, but probably at least 5,000,000 waterfowl of all kinds wintered in eastern Mexico. The duck population of the tableland and coastal areas of western Mexico, however, was materially lower than in 1938-39. The season was abnormal, investigations in California, made both before and after the Mexican operations, indicating that large groups of the Pacific Flyway waterfowl had wintered north of the international border.

Investigations in the United States

A greater spring run-off improved nesting conditions on the Federal refuges in the northern plains and increased their production of waterfowl. The extent of the increase is indicated by an estimate of 250,000 ducklings on the Lower Souris Refuge, N. Dak., compared with 40,000 for 1938, and of similar gains on other refuges. It was noteworthy that in several cases the species affected were among those that only a few years ago were considered to be in a precarious condition, among them the redhead, canvasback, and ruddy duck. The Canada goose also made important local gains.

The fall migration was characterized by a delayed movement of the birds. Storms and freezing temperatures came much later than usual, and when winter closed in quickly the waterfowl passed so rapidly through some sections that they were all but unobserved, particularly where there was a shortage of water. The Bureau's volunteer observers, however, submitted more than 500 reports, and considering the abnormal weather, which unquestionably affected the observations, these showed a satisfactory condition of the birds.

The biologists of the Mississippi and Atlantic Flyways devoted the winter to studies of the usual concentrations of ducks and geese in the lower Mississippi Valley and on the south Atlantic coast, the chief wintering grounds for these two flyways, and noted a gratifying increase in both ducks and geese. Supplementing the results

were weekly or monthly reports from refuge managers, game-management agents, and other field officers, the regularity of which kept information current on the movements of the birds and of the conditions affecting them.

Large flocks of ducks from the Atlantic Flyway may cross the Straits of Florida to winter in extensive swamps and at the heads of bays in Cuba, and it is known that some continue eastward to wintering grounds on the island of Hispaniola. This flight is the least known of any included in the flyway system and points to the need of winter investigations in the Greater Antilles. There is no known or suspected important wintering ground of the Mississippi Flyway south of the United States.

The sixth consecutive January inventory was conducted by between 2,000 and 3,000 persons under exceptionally trying conditions, but the results completely vindicated the methods employed. Despite freezing weather extending to the Gulf coast, and prevalent deep snows, the operation was carried out on schedule. Practically the entire field force of the Bureau was utilized, together with personnel of other Federal and State agencies, and aircraft of the Army, Navy, and Coast Guard and of a commercial tire and rubber company. The results indicated that there were about 65,000,000 ducks and geese on the North American Continent at that time in contrast to the low of 27,000,000 estimated for January 1935.

OTHER MIGRATORY GAME BIRDS

In the winter, most of the woodcocks of the continent gather in Louisiana and western Mississippi and the mourning doves of eastern North America concentrate heavily in the Southeastern States. Investigations in January showed that both species suffered serious losses because of abnormally cold weather. A later Nation-wide study showed that both species had been reduced materially in numbers, the woodcock as much as 40 percent in some areas. Appropriate safeguarding action was accordingly taken. A study of the Wilson's snipe showed that it too was affected, but its wider range made the results less menacing.

Studies of the western white-winged dove have been made in Arizona for 3 years, and this year the investigation was extended to include the eastern form in the Rio Grande Valley in Texas. Although the latter study is too new to serve as a basis for administrative action, the indications are that these doves are being heavily overshot in both regions. Regulatory action has been taken to reduce the kill in Arizona and probably must also be done in Texas. It

seems questionable whether this bird can continue to be used as a game species unless the conditions affecting its welfare can be improved.

A detailed report on the status of all migratory game birds, as revealed by the year's investigations, was issued in June as Wildlife Leaflet 165 (processed).

BANDING GAME AND OTHER BIRDS

Work on Federal Refuges

The refuge and other Bureau personnel are now so favorably located that they will be able to band most of the ducks and geese necessary for the continuation of these studies, though a few stations operated by volunteer cooperators are still of primary importance because of the volume of work done. The birds banded on Federal refuges totaled 58,852, an increase of more than 22,000 over 1939. Reports on refuges banding more than 1,000 each are as follows:

Refuge:	Number	Refuge:	Number
Sand Lake, S. Dak-----	17,339	Klamath Lake, Oreg., and Clear Lake and Tule Lake, Calif-----	2,305
Des Lacs, N. Dak-----	8,481	Lower Souris, N. Dak-----	2,298
Bear River, Utah-----	5,534	Sacramento, Calif-----	2,072
Malheur, Oreg-----	5,502	Medicine Lake, Mont-----	1,711
Chautauqua, Ill-----	4,089	Waubay, S. Dak-----	1,288
Piedmont, Ga-----	3,212	Cape Romain, S. C-----	1,012

As opportunities offered, game-management agents, field biologists, and other Bureau employees banded an additional 6,575 birds, bringing the grand total banded by them to 65,427.

Bird-banding Cooperators

To weed out cooperators who had become inactive or had never participated actively in bird-banding work, and to permit the addition of promising new station operators, a drastic revision of the list was in progress at the close of the year. Seven cooperative stations each reported the banding of more than 5,000 birds, as follows: E. A. McIlhenny, Avery Island, La., 28,909; O. L. Austin, North Eastham, Mass., 22,426; C. M. Owens, Monticello, Ark., 12,737; C. C. and F. E. Ludwig, Lansing, Mich., 8,377; G. C. Munro, Honolulu, Hawaii, 7,321; Hugh S. Davis, Tulsa, Okla., 5,670; and Geo. H. Lowery, University, La., 5,420. The work at Avery Island was particularly remarkable, as it included thousands of waterfowl of several species, hundreds of vultures and herons, and a large variety of small nongame birds.

Additional Birds Banded

Birds to the number of 428,185 were reported banded, bringing the total since 1920 to 3,712,327. Species banded in excess of 10,000 were the mallard, 40,046; chimney swift, 38,821; common tern, 24,318; pintail, 21,506; junco, 21,399; white-throated sparrow, 21,147; herring gull, 15,911; grackle, 11,844; and starling, 10,324. For the first time a species of waterfowl headed the list. Additional species of waterfowl banded in excess of 1,000 were the ring-necked duck, 4,560; green-winged teal, 4,524; blue-winged teal, 3,553; baldpate, 2,328; and Canada goose, 1,931. In all, 478 species of birds were banded, the following 9 for the first time: Rhinoceros auklet, Audubon's shearwater, black oystercatcher, sage hen, Mississippi kite, spotted owl, and rufous-crowned sparrow, and in Hawaii the small gray tern and the Phoenix Island shearwater. Records of waterfowl banded in 1939 and 1940 are shown in table 1.

TABLE 1.—Waterfowl Banded During the Fiscal Years 1939 and 1940

Species	1939	1940	Species	1939	1940
	<i>Number</i>	<i>Number</i>		<i>Number</i>	<i>Number</i>
American merganser	32	12	Greater scaup	914	27
Red-breasted merganser	1	4	Lesser scaup	5,290	1,958
Hooded merganser	14	12	Ring-necked duck	1,953	4,560
Mallard:			American goldeneye	10	8
Wild	15,751	37,969	Barrow's goldeneye	1	
Hand-reared	981	2,077	Bufflehead	18	6
Black, cross	20	19	Old squaw		4
Black duck:			Harlequin duck		3
Wild	8,653	9,889	American eider	4	1
Hand-reared	1,554	98	White-winged scoter	23	1
Florida duck	86	27	Ruddy duck	41	69
Gadwall	781	505	Snow goose	4	12
Baldpate	1,449	2,328	Blue goose	16	92
Green-winged teal	1,721	4,524	White-fronted goose	8	52
Blue-winged teal	4,118	3,553	Canada goose:		
Cinnamon teal	379	188	Wild	1,163	1,815
Shoveler	582	714	Hand-reared	24	116
Pintail:			Emperor goose	1	
Wild	18,861	21,419	Fulvous tree duck	1	1
Hand-reared	299	87	Whistling swan	7	1
Wood duck	414	686			
Redhead	629	557	Total	66,290	94,101
Canvasback	487	707			

Return and Recovery Records

The total number of new bandings shows a slight decrease from 1939, and the number of banded birds recaptured and reported increased by 5,018 (from 26,998 to 32,016). This is due largely to the greater number of banded ducks and geese at large, so many returns of which result from the hunting kill. Among the returns were records that not only extend the known ranges of the species but also contribute to the knowledge of the flyways and individual migration routes, migration speed, longevity, and other life history details. Reports on outstanding recovery records have been pub-

lished in the quarterly journal *Bird-Banding*, and an article on the winter range of the herring gull, based chiefly on banding data, has been prepared for publication in *The Auk*. *Bird Banding Notes* (vol. 3, no. 1, processed), containing details of the work during the year, was issued in October.

Distribution and Migration Records

Additions to the files on the distribution and migration of North American birds included 19,000 individual observations, together with 1,080 bibliographic cards and 860 locality references. Seasonal migration reports were received from 235 of the 342 observers now listed. *Bird Migration Memorandum No. 5* (63 pp., processed) was issued in November, presenting by flyways a comparative analysis of the fall migrations of 1937 and 1938. Work has been completed on tables analyzing spring migration data from five stations in Florida, North Carolina, Pennsylvania, New York, and New Brunswick, three of which have made reports, almost without a break, since 1886. Distribution maps have been prepared for 26 species of sparrows, and available data have been analyzed for 6 others. Two wildlife leaflets, *Birdbanding* (No. 145) and *Suggestions for Bird Field Study* (No. 150), were revised and a new one, *Original and Present Breeding Ranges of Certain Game Birds* (No. 158) was issued. Distribution and migration sections covering the flycatchers and swallows, to be used in National Museum bulletins on the life history of North American birds, also have been prepared. Corresponding data were included in the volume issued toward the end of the year on the parrots, cuckoos, goatsuckers, hummingbirds, trogons, and related species.

WILDLIFE RELATIONSHIPS TO FOREST AND RANGE

Studies on the San Joaquin Range Experimental Station, Calif., indicate that pocket gopher burrowing actually increased the growth of forage but that the quantity of forage destroyed by these animals exceeded this increase. Methods have been developed to make accurate censuses of ground squirrels, the numbers of which seem to be kept down by intensive grazing though not affected by light to close grazing. Experiments are under way to determine the effects of rodents on soil erosion, porosity, and water percolations. The coyote-deer relationship study on the Los Padres National Forest was completed.

Investigations in New England on improving wildlife foods by planting trees and shrubs show that thrifty 2-year-old plants, top-pruned and properly spaced, were economical in establishing cover

islands and fringes adjacent to forest areas. Annual food patches are not needed in typical New England forests, and special plantings over large areas of food trees for wildlife alone are not justified. The shaping, pruning, and encouraging of the 10 common kinds of food trees and shrubs coming into natural stands seems to be the best means of managing these forests for wildlife.

A report on wild-animal damage to seed and seedlings on cut-over Douglas fir lands of Oregon and Washington is in press, and papers on the relationship of pocket gophers to mountain meadow ranges and the role of rabbits and mountain beavers in Douglas fir plantations have been completed.

Suggestions were made for managing white cedar yards for deer in the Lake States region. As a 12-inch cedar produces 74 pounds of browse and when felled is capable of feeding one deer in winter for about 16 days, it was recommended that cedar be logged late in winter—a critical time for deer.

Studies showed that the European starling (*Sturnus vulgaris*) is becoming a factor in longleaf pine reproduction in Mississippi. Examination of starling stomachs taken in areas where the seed was available disclosed them filled chiefly with pine seed.

BIOLOGICAL INVESTIGATIONS ON WILDLIFE REFUGES

A survey of forage conditions was continued on the Wichita Mountains Wildlife Refuge, Okla., to determine changes during the second year of freedom from livestock. Three-awn grasses, of little forage value and often injurious to grazing animals, grow abundantly over the refuge, most commonly where there has been overgrazing. A browse study plot was established in an area containing growths of sumac, to determine the effect of herbaceous ground cover on the growth and spread of this shrub, as it appears that sumac may be an indicator of overgrazing on some soil types, coming in after the herbaceous cover has been depleted. Mimeographed lists of the mammals, birds, reptiles, and amphibians of the refuge were compiled for distribution.

Studies were begun on the range requirements of antelopes on the Charles Sheldon Antelope Refuge and Range, Nev., and on the Hart Mountain Antelope Refuge, Oreg., with a view to determining the carrying capacity of these areas for antelopes and mule deer and the grazing by domestic stock that can be permitted on the Charles Sheldon tracts. Good progress has been made in this work, which will be extended to include a complete cover-type survey and range map of the areas.

Progressive experiments and observations have been made on the Cape Romain Refuge, S. C., toward the development of Bull Island for wild turkeys. This work, carried on for 2 years, has now been completed as a special project, though work will be continued in a limited way as a study for improving food and cover relationships and for establishing breeding stock of native wild turkeys of pure strain.

WILDLIFE MANAGEMENT RESEARCH

Cooperative Research Units

A 5-year program of basic research on wildlife management problems, carried on at 10 land-grant colleges, has been completed and a second 5-year plan drawn up to obtain information on the best methods to be used in wildlife restoration and management, to demonstrate management practices on large areas, and to provide special training in wildlife work for advanced students. The 10 units were cooperatively financed by the State game and conservation commissions, land-grant colleges, the American Wildlife Institute, and the Bureau of Biological Survey. Advanced degrees were received by 27 students, who completed research on assigned problems. Following were the principal activities of the units:

Maine.—Techniques have been developed for censusing woodcock through counting occupied singing grounds and nests and counting the broods with the aid of dogs trained to locate the birds. Through pen studies snowshoe hares were found to breed the same day young are dropped, the gestation period averaging 36 to 37 days. Factors in the mortality of young rabbits included destruction by the mother, cannibalism, predators, and wandering away. Other work included aquatic plantings in many lakes and studies of deer and moose and of silvicultural methods in relation to wildlife.

Pennsylvania.—The comparative attractiveness to wildlife of two forest areas of different types in Centre County, one of 7,000 and the other of 9,000 acres, was studied. In the barrens, where there was an abundance of browse and mast, ruffed grouse and turkeys were plentiful, and there was one deer to 18 acres. In the Seven Mountains region, where the forest is composed of aged hardwoods with little understory, the grouse were scarce, turkeys plentiful, and there was one deer to 116 acres. Studies were made also of pheasants, ruffed grouse, woodcocks, black bears, and cottontails.

Ohio.—Management practices for fox squirrels were determined and tested in farm wood lots. Land-use factors affecting pheasant production and the value of a refuge system were worked out. Conclusions from red-fox studies indicated that year-round hunting is removing the annual surplus, that the present abundance does not call for control measures, that where poultry is kept from wooded areas in spring, no losses have resulted, and that the average population of foxes is 1.5 per square mile. Studies on raccoons showed a population of 1.12 for each mile of permanent stream or 2.58 per square mile.

Virginia.—Using mass-production methods, 900 wild turkey poults were raised. In one release of 34 birds, 23 survived the first year. Studies showed that the

situation of gobbling areas may influence the utilization of nesting sites in natural range. More than 470 turkey crops, representing all months, were examined. Quails, ruffed grouse, deer, and elk were also featured in the research program.

Alabama.—A 16-mm. color film, *Nesting Cycle of the Mourning Dove*, was prepared and shown to audiences in several States. Information on management practices was obtained from 450 quail-food plots, as to growth, yield, availability, planting seasons, propagation methods, pests, and diseases. Data from 359 fox stomachs and 32 dens indicated that the major food items of these animals are rabbits and insects, there being little evidence of quail destruction.

Missouri.—Studies of cottontail rabbits revealed an annual average of 3.8 litters per female, of 4.4 young per litter, and of 16.7 young per female. Research into the management of field borders in relation to agriculture and wildlife revealed that (1) bird populations varied in proportion to the density of edge growth; (2) birds were a factor in limiting insect populations; (3) birds seemed to take more harmful than beneficial insects; and (4) field edge growth was of value in protecting crops from destructive insects. Observations on deer showed that 60 species of plants were utilized as food late in summer and in fall and 70 species of woody vegetation in winter. Yields of these foods in post oak forests were 84 pounds per acre in sapling stands, 147 pounds in pole stands, and 128 pounds in merchantable stands. Management practices for quail included restriction of the kill, planting of food patches, and reduction in burning, grazing, and clean-up activities, resulting in an increase in quail on a 5,000-acre area from 996 in 1937 to 2,778 in 1939. Studies were made also of chukar partridges and prairie chickens. Although 165,000 live rabbits were shipped to 20 States during the year, a winter census revealed no depletion in the local rabbit population.

Iowa.—A 5-year study in quail management on two agricultural areas showed that three severe winters accounted for 87, 74, and 55 percent losses, with midwinter starvation, clean-harvested cornfields, and a high rate of predation as important factors. For nesting, redhead ducks were found to require small pot holes of 5 to 20 acres and open water within 150 feet of the nest. Studies yielded valuable information also on ring-necked pheasants, mourning doves, raccoons, cottontails, foxes, skunks, and fox squirrels.

Texas.—In central Texas, observations on quail headquarter areas, having brush-and-pole shelters and food patches, showed 75 percent occupied and in the coastal prairie region 63 percent. Studies on prairie chickens showed that the limiting factors were land cultivation, pasture burning, May rains, over-shooting, heavy grazing, and development of oil fields, drainage canals, and roads. Three county wildlife surveys and a study of relation of land-use practices to wildlife in eastern Texas were completed. Reports for the agricultural-extension program showed that 25,000 farm people in 207 counties cooperated in aiding wildlife on 27,000,000 acres.

Utah.—Observations on sharp-tailed grouse in 16 areas having a population of 1,000 birds showed that of 106 nests, 40 hatched, and 66 were destroyed by farming, and that 83 percent in native-grass vegetation were successful, and in cultivated fields 27 percent. In 1940, 47 broods averaged 10 birds each. Sage grouse studies at the DuBois Sheep Experiment Station (Idaho) revealed that of 132 nests, 51.5 percent were successful, and that of the nests lost, 38.8 percent were destroyed by livestock, 22.2 by crows, 22.2 by coyotes, 5.5 by weasels, and 11.3 percent by unknown agents. Other studies involved deer, elk, and beavers.

Oregon.—Studies on ring-necked pheasants on Protection Island (Washington) indicated that where 10 cocks and 6 hens had been released in 1937 under

natural conditions, there were, in 1940, 185 cocks and 97 hens. Records for the Willamette Valley in 1936 showed 1 game bird to 77 acres, and in 1940, 1 bird to 10 acres. One demonstration management area, without restocking, beginning with 1 bird per 100 acres in 1936, harbored a population in 1940 of 16 birds per 100 acres. Studies were completed on the antelope and sage grouse and on mule deer problem areas.

STATE BIOLOGICAL SURVEYS AND FAUNAL STUDIES

Preparation of the report on the mammals of Arizona was resumed near the close of the year. Work was continued on the mammals of Florida, and the report almost finished. A revision of the raccoons was brought nearly to completion. Research on the life history, economic status, classification, and distribution of the wolves of North America advanced, and the results are now being arranged for publication. A manuscript on the American elk was completed.

Investigations on the life zones and mammals of Washington, begun several years ago, continued with progress. A comprehensive work entitled "Birds of Oregon" (650 pp., illus.), under the authorship of the Chief of the Biological Survey and Stanley G. Jewett, regional biologist, was published in April by the Oregon State College, thus making available to the public the results of information on the bird life of the State. A manuscript on the extensive study of the birds of Texas should be ready for printing by the end of the calendar year. In an intensive study of the marten in Idaho particular emphasis was placed on its relation to other animals and on trapping. This animal is generally considered a vanishing species, and the study indicates that the chief cause of its scarcity is overtrapping.

Research on the wild turkey has shown that the effects of civilization are to extirpate the species where suitable management is not applied. At no place is the bird increasing in numbers or even holding its own in the absence of such objective management. The principal factor in its decrease is a hunting take, both legal and illegal, in excess of the annual increment above breeding populations. Other factors are natural enemies, unfavorable changes in range ecology, disease, deforestation, industrialism, and human influences in the vicinity of its range, drainage, fire, overgrazing by domestic stock, and interbreeding with domestic varieties.

The study collections of mammals, birds, and other vertebrates continue to be essential both for the Bureau's research work and as a basis for administrative operations. Continued progress has been made in recording information based on collections, reports, and publications and in preparing reports on relationships, distribution, and habits of species. During the year 624 mammal specimens were

added to the collection, 1,191 were identified for 30 institutions and individuals in 27 States and 1 foreign country, 92 were borrowed for study from 3 institutions in 3 States, and 591 were loaned to 13 institutions and individuals in 11 States. Bird specimens to the number of 1,536 were added to the collection, 859 were identified for 35 institutions and individuals in 20 States and 1 foreign country, and 358 were loaned to 19 institutions and individuals in 11 States and 1 foreign country.

Bureau biologists described 27 new mammals belonging to the genera *Dipodomys*, *Odocoileus*, *Onychomys*, *Neotoma*, *Perognathus*, *Peromyscus*, *Reithrodontomys*, *Scalopus*, *Sylvilagus*, and *Taxidea*. Type specimens in the mammal collection now number 1,325. The mammal laboratory was utilized by 130 research workers other than Bureau employees from 27 States and 1 foreign country. An account of the mammal collection was given in a Wildlife Leaflet (BS-153), and the following additional leaflets were issued relating to biological surveys and other work basic to wildlife conservation: Big-game Inventory of the United States, 1938 (BS-142), Raising Deer in Captivity (BS-144), Status of the American Bison in the United States and Alaska, 1939 (BS-148), and Suggested Action for Sportsman's Organizations (BS-152).

ECONOMIC RESEARCH ON WILDLIFE

WATERFOWL-MANAGEMENT INVESTIGATIONS

Waterfowl-Nesting Studies

As a basis for determining the factors affecting waterfowl production on national wildlife refuges, nesting studies were conducted on the following refuges: Crescent Lake, Nebr.; Bear River, Utah; Malheur, Oreg.; Lacreek, S. Dak.; Valentine, Nebr.; and Lower Souris. N. Dak. These indicated that depredations by bull snakes, skunks, ravens, magpies, and California gulls continued to be an important menace to the welfare of nesting waterfowl.

Ecological and Management Studies

In surveys made in Utah important factors limiting the production of aquatic vegetation were found to be salinity, turbidity, absence of organic muck, receding water levels, and the wave action caused by strong winds. Transplanting demonstrated the value of saltgrass (*Distichlis stricta*) and saltbush (*Atriplex hastata*) as cover plants for soils where high concentrations of soluble salts preclude most other growths, except foxtail (*Hordeum jubatum*), which has some objec-

tionable qualities. Duck-food plants found to have a wide salinity tolerance are hardstem bulrush (*Scirpus acutus*) and glasswort (*Salicornia rubra*).

Succession of vegetation on artificial banks over the past four years was correlated with nesting utilization by waterfowl, and it was learned that the pioneer stages were best suited to nesting. Studies showed that while artificial islands were not utilized by ducks and geese, 4 of these islands held 1,580 California gull, 14 cormorant, and 66 Caspian tern nests. Muskrats were found beneficial in making ponds in dense emergent growth, and on one area as high as 45 percent of all goose nests located during four years were on muskrat lodges.

A technical report on the alluvial marshes and swamps of Louisiana was prepared for publication. Experimental burning of marshes on the Sabine and Lacassine Refuges, La., indicated the importance of fire as a management tool. It was estimated that more than 500,000 geese used these burned areas. Livestock grazing prolonged the value of burns.

Management studies at the Malheur Refuge, Oreg., showed that giant burreed (*Sparganium eurycarpum*) was benefited rather than retarded by disking, that deep water impoundments favored the growth of hardstem bulrush (*Scirpus acutus*), and that mowing and grazing of wet meadows properly handled instead of noticeably hindering waterfowl breeding proved beneficial during fall, winter, and early spring by keeping the meadows open as foraging places for the birds.

Reconnaissance of Refuges and Refuge Sites

Reconnaissance was made of possible refuge sites in New England, particularly in Massachusetts, where past surveys showed the need for a major waterfowl area to round out the national wildlife refuge system along the Atlantic Flyway. Studies of wildlife problems were made on the Santee-Cooper power and navigation project, South Carolina; at Reelfoot Lake, Tenn.; on the Tobay Bird Sanctuary, N. Y.; in Shinnecock Bay, Long Island, N. Y.; in Ottawa and Lucas Counties, Ohio; in Mobile Bay, Ala.; in Pepin and Pierce Counties, Wis.; at Catahoula Lake, La.; on the Gilbertsville Reservoir, Tenn.; and on the Wheeler Refuge, Ala. With a view to assisting in the application of research findings in refuge development, surveys also were conducted on various other Federal refuges under the administration of the Bureau, including the following: White River, Ark.; Kentucky Woodlands, Ky.; Bombay Hook, Del.; Pea Island, N. C.; Noxubee, Ala.; and numerous other units.

Suppression of Waterchestnut

Studies to develop methods for suppressing the waterchestnut on the Potomac River were continued. Various chemicals and cutting devices were tried out in cooperation with the War Department and the C. C. C., and chemical tests were made with the assistance of a private industrial concern. The results of the mechanical control carried out last year were checked and found favorable, with only a minimum of follow-up work necessary. The job of completely eradicating the pest, however, becomes of greater magnitude each year. State authorities in New York were advised regarding waterchestnut control on the Mohawk River.

Canada Goose Management Studies

In Utah, Oregon, and California, studies of Canada geese and the factors influencing their increase were continued. A trap was designed and used in banding 1,263 wild geese on the Bear River Refuge, Utah, and a method of shipping the birds under adverse summer conditions was worked out. Experimental transplantings of young geese were made at four midwestern refuges and reports indicate that the birds will serve as nuclei for future breeding populations. Field studies were made of the feeding habits of geese in the Great Basin and in the Northwest.

Redhead Duck Management Studies

The tendency of redhead ducks to lay eggs in the nests of other birds was noted on the breeding grounds of the Bear River Refuge as an important contributing factor in the failure of the redhead population to recover promptly from disasters. In heavily shot-over habitats lead poisoning was found an important cause of mortality during certain seasons. Most of the redheads leave the breeding grounds by the opening of the shooting season, so the hunter kill is low on northern Utah marshes. A map was prepared showing the migration routes and concentration areas in the United States of redheads banded at Bear River.

MOSQUITO CONTROL IN WILDLIFE HABITAT

A detailed experimental project, set up at the Bombay Hook Refuge, Del., in an attempt to demonstrate methods least injurious to wildlife habitat for the control of saltmarsh mosquitoes, common along the Atlantic and Gulf coasts, resulted in an encouraging reduction of mosquito breeding and in an improvement of the area

for waterfowl and other aquatic life. At the Wheeler Migratory Bird Refuge, Ala., where many large impoundments have already been made, cooperative studies with the Tennessee Valley Authority, Bureau of Fisheries, Public Health Service, and Bureau of Entomology and Plant Quarantine have been under way during two summers, with the objective of coordinating more effectively necessary mosquito control with refuge management and wildlife conservation.

LABORATORY RESEARCH ON FOOD HABITS

A summary of laboratory investigations of food habits is contained in table 2, which shows that 6,264 unit analyses were made representing 147 species of amphibians, reptiles, birds, and mammals. In addition, many identifications of plants and plant parts, insects, reptiles, bones, and hairs were made for various institutions and research workers engaged in wildlife investigations.

TABLE 2.—Wildlife food analyses made in 1940, showing by class the numbers of species and units examined

Class	Stomachs		Pellets		Scats		Food remains † from—				Total	
							Nests		Dens of mammals			
	Species	Units	Species	Units	Species	Units	Species	Units	Species	Units	Species	Units
Amphibians	1	4									1	4
Reptiles	11	286									11	286
Birds	87	2, 632	9	701			2	40			98	3, 373
Mammals	30	1, 429	1	30	5	1, 110			1	32	37	2, 601
Total	129	4, 351	10	731	5	1, 110	2	40	1	32	147	6, 264

¹ Numbers represent units of material.

Field observations were made in areas in Arizona where band-tailed pigeons were abundant, analysis of 382 stomachs was completed and the results were tabulated, and a manuscript on a preliminary study of the habits, food, and economic status of these birds was completed.

COOPERATIVE FOOD HABITS RESEARCH

Investigations of Wildlife Research Units

Cooperative research on the food habits of birds, mammals, and reptiles was conducted with 8 of the 10 cooperative wildlife research units, and 1,632 unit examinations representing 19 species were made. The Alabama and Virginia units detailed student assistants to make analyses in the food habits laboratory at Washington, D. C., where large reference collections and laboratory facilities are available.

Aid to Federal, State, and Other Agencies

For the Forest Service, 333 unit examinations of 13 species of animals was made and a paper published on the early winter food habits of the black bear in the George Washington National Forest; for the Soil Conservation Service, 116 bird stomachs of 22 species were analyzed; and for the Public Health Service, National Park Service, Bureau of Animal Industry, and the Tennessee Valley Authority, various stomach and pellet examinations were made.

A collaborator assigned by the Conservation Department of New York examined stomachs of 296 ruffed grouse and 82 ring-necked pheasants collected in that State. Analyses made by the Bureau for other State agencies were as follows: Texas Game, Fish, and Oyster Commission, stomachs of 36 house cats, 11 white-tailed deer, and 10 turtles and 19 otter scats; Michigan Commission of Conservation, 111 stomachs of 5 species of predatory animals and 81 otter scats; Alaska Game Commission, 34 coyote stomachs; California Department of Natural Resources, 54 stomachs of 5 species of predatory animals; Colorado State Game and Fish Commission, 4 house cat stomachs; Montana State Fish and Game Commission, 13 great blue heron stomachs; Nebraska Game, Forestation, and Parks Commission, 4 ring-necked pheasant stomachs; New Mexico State Game and Fish Commission, 29 merganser stomachs; Vermont Department of Conservation and Development, 51 bobcat stomachs. Stomachs of 25 mule deer and of 44 predators of 4 species were analyzed for various States in connection with the Federal aid in wildlife restoration projects, and 56 California quail stomachs were examined for the California Quail Committee. Special examinations made for private individuals and agencies included 391 unit examinations of 36 species and subspecies of birds and 92 unit examinations of 1 species of mammal.

NEW FOOD HABITS LABORATORY AT PATUXENT RESEARCH REFUGE

The Food Habits Laboratory maintained at Washington, D. C., since 1885 was transferred in June to the Patuxent Research Refuge, Bowie, Md., where there was recently completed a 3-story brick building with two floors devoted to laboratories, administrative offices, and library, and the third to scientific collections, equipment, and supplies, where also a modern greenhouse is available for use in studies of wildlife food propagation, and where there is opportunity to work with aquatic plants on the recently created impoundment known as Cash Lake. The new laboratory is named in honor of C. Hart Merriam, the first Chief of the Biological Survey.

The first research contribution from this refuge was issued under the title "Flora of the Patuxent Research Refuge, Maryland" (Wildlife

Leaflet 154, processed). It contains a detailed list of the plants and information about the size, topography, water supply, geology, and soils of the refuge.

STUDIES OF NUTRITION AND PHYSIOLOGY OF UPLAND GAME BIRDS

Cooperation was continued with the Bureau of Animal Industry, United States Department of Agriculture, in bobwhite studies to determine the nutritional requirements of the bird, the nutritive qualities of its native foods, and the effect of various levels of protein intake on its live weight, food consumption, and reproduction. Food selectivity tests were made and mortality problems studied in experiments with 816 young quails to determine the proportion of protein that gives optimum growth and lowest mortality. The nutritive value and palatability of acorns and wild beans and the seeds of lespedeza, black locust, ragweed, crabgrass, and bullgrass were studied in an experiment with 264 adult birds during the winter. A liberation study to determine the survival of captive-reared quails under natural conditions was begun in the fall. A Wildlife Leaflet (BS-163), *Common Salt as a Curative for Cannibalism Among Game Birds in Captivity*, was distributed and a manuscript on bobwhite quail propagation was completed for publication. The Virginia Polytechnic Institute at Blacksburg cooperated by assigning a collaborator to work out the chemical composition of certain native quail foods. Studies were also initiated to determine the vitamin A content of acorns.

Studies of the physiological activities and metabolic reactions of upland game birds, conducted in cooperation with Cornell University and the New York Department of Conservation, were devoted largely to the designing and constructing of equipment, the most important being a special calorimeter cabinet in which temperature, light, humidity, and air movement are automatically recorded and controlled.

STUDIES OF INJURIOUS BIRDS

Robin and Oriole Damage to Grapes

Investigation of complaints of depredations by robins and Baltimore and orchard orioles on grapes in vineyards near Omaha, Nebr., disclosed that the number of farmers suffering losses was small, but that on some vineyards damage was done to as much as 20 percent of the crop. Experiments involving trapping and shooting and investigations of the use of various frightening devices indicated that the latter may afford relief.

Crow Depredations on Nesting Game Birds

An analysis of 143 returns from 714 crows banded and released in Oklahoma during the winter of 1935-36 indicated that a large part of the crows wintering in Oklahoma breed in Canada and the Northern States, and therefore local crow control cannot have any appreciable effect on crow depredations on nesting Oklahoma game birds as alleged by promoters of widespread winter crow control in the State.

Sandhill Crane Damage to Grain

Sandhill cranes are wintering apparently in increasing numbers in eastern and southeastern New Mexico, where sorghums, Indian corn, and other small grains comprise much of the cultivated crops. Field investigation has shown that while complaints of damage have some justification, there is a marked variation from year to year in the number of birds present and in the resultant damage. Since the birds are daylight feeders and are easily frightened by gunfire, driving them away locally under proper safeguards and restrictions seems a practical way of preventing this damage.

Duck Injury to Peas and Grain

Ducks wintering in the San Luis Valley, Colo., have at times been the subject of no little complaint because of their feeding on peas left in the fields. To learn their status in winter in this valley, about 330 ducks of 4 species were banded. An appraisal also was made of damage by ducks to grain in northeastern Colorado. Field tests carried on to determine the effectiveness of certain frightening measures against waterfowl were followed by the issuance of a leaflet (BS-149) entitled "Protecting Field Crops From Waterfowl Damage by Means of Reflectors and Revolving Beacons."

Merganser Menace to Game Fish

In response to claims that mergansers were taking great quantities of game fish in the Rio Grande and Pecos Valleys of New Mexico, an investigation was made of the food habits of the birds. Stomach analyses revealed that on the upper Rio Grande the mergansers were not overly destructive to game fish but that they made bass and crappies more than 50 percent of their food on Elephant Butte Lake.

Other Bird-Control Activities

A restatement of Federal policies in bird control in the light of recent problems was presented before the Fifth North American Wildlife Conference in a paper on suggesting methods of approach. The method

suggested rests on the premise that much can be done to alleviate bird damage by the adjustment of cultural and harvesting practices in agriculture and that the farmer can best be approached through the State agricultural experiment station and the extension service.

Experiments in preventing crop damage or controlling birds injurious to crops in California continued and methods as yet incomplete were tested and species that had not before been successfully handled were studied. The third unit of a three-part manual on procedure and methods in controlling birds injurious to crops in California was completed and distributed to qualified county agricultural departments to enable them to handle bird complaints judiciously and conservatively. Leaflets issued on bird control included Protecting Blueberries from Damage by Herring Gulls (BS-141) and Suggestions for the Control of Vagrant Domestic Pigeons (BS-143).

RESEARCH IN THE CONTROL OF HARMFUL MAMMALS

To apply effectively measures for the control of injurious species of mammals it is necessary not only to perfect new traps and better lethal agents but to know the habits of the wild animals with which the farmer and stockman frequently have to contend. The Wildlife Research Laboratory at Denver continued its studies of the life habits of the pine mouse, meadow mouse, mole, porcupine, and woodchuck as a basis for developing improved control methods, as well as those on the use of fumigants and repellents in control practices and methods of application.

Predator Studies

Further experimental work to improve traps and trapping technique and to determine the efficacy of other devices and methods for taking predatory animals was conducted. Studies were continued to determine the relationship to predation of the seasonal drift and other natural habits of coyotes to their predatory tendencies and methods of control.

Repellent Experiments

The control of certain species of injurious animals in many instances can be accomplished through the use of a repellent instead of lethal baits. Noteworthy advances have been made in developing sprays and paints for the protection of trees against rabbit depredations. Sprays reduced the rabbit damage to a stand of pine seedlings in Louisiana and Texas from 35 to 3 percent and to tree plantings in a South Dakota silvicultural experiment from 24.8 to 7 percent. Studies concerned with the development of an inexpensive spray that will withstand adverse weather conditions are being continued.

Laboratory Investigations

Studies were conducted to develop a method to concentrate the active principle of red squill to standardize powders of varying toxicity for use in rat control. In cooperation with the University of Beirut, at Lebanon, Syria, studies were continued to determine the relationship of the toxicity of squill bulbs to growing and cultural conditions, and in cooperation with the New Mexico A. and M. College experiments were inaugurated in growing squill bulbs in this country.

FUR-ANIMAL CONSERVATION AND RESTORATION

FUR PRODUCTION AND THE FUR TRADE

War and the Fur Trade

War conditions have made imports and exports of furs more difficult and have called former trappers in foreign countries into the military service. As the shortage of fur imports increases and domestic markets depend more and more upon American production, larger numbers of native fur animals will be needed to meet the demand. To maintain our own source of supply will necessitate limited trapping, shorter seasons, and Federal, State, and individual cooperation in the production and conservation of fur animals. A deeper realization of the purpose and possibilities of producing more fur animals on State and Federal lands and on fur farms is being developed.

Fur Supply and Annual Take

The trapping required to supply the Nation's \$50,000,000 fur market indicates that the consumption of furs in the United States is exceeding the annual production. The danger of depleting this great natural resource was stressed by the Secretary in a statement based on available figures on the national annual take of fur animals, which emphasized that the data are not accurate enough to maintain a careful check on the situation. Lack of authentic information on the numbers and origin of animals trapped annually in the United States and on the number of domestic furs marketed prevents an intelligent estimate of the annual harvest. The States cannot undertake effective management of their fur resources until they require reports on the extent of the season's trapping, as a basis for assembling accurate data relative to the populations of the animals.

Silver Fox Quota

The outbreak of the European war would have forced out of business nearly all the silver fox farmers in the United States had not prompt action been taken to prevent the dumping of Canadian and European

pelts on the American market. Recognizing the situation as the most critical in the 30-year history of American fur farming, the Secretary called to the attention of the Committee for Reciprocity Information the possibility that a flood of foreign furs would undermine the American industry. Conferences between representatives of fur farmers and various Government officials followed, and a Supplementary Trade Agreement between the United States and Canada was negotiated on December 30, 1939, establishing an import quota of 100,000 silver foxes, including both live animals and pelts. Establishment of this limit not only maintained but increased the prices paid for silver fox pelts during the winter. The sale of a single Norwegian platinum fox pelt for \$11,000 and of an entire lot of 400 platinum skins for more than \$500 each gave impetus to the production of platinum and freakishly colored foxes in the United States. The Bureau of Customs decided that the platinum type of fox falls within the range of silver foxes as recognized in the United States and is therefore dutiable and comes within the import quota.

Selling Federal Furs

The national wildlife refuges are great reservoirs for fur-animal life, and the restoration and development of this natural resource, based on research, are elements essential to their management. A definite policy was established for handling and disposing of all furs that become surplus property of the refuges, and a system of selling is being devised that will supply valuable information in the fur-research field, return a maximum revenue to the Government, and reduce administrative details.

COOPERATIVE INVESTIGATIONS

Reproduction Studies

Minks.—In studies on the reproductive cycle of fur animals conducted in cooperation with the Bureau of Animal Industry of the United States Department of Agriculture, Swarthmore College, and the Carnegie Institution of Washington, a colony of 27 minks was maintained at Swarthmore College for intensive study. A number of articles published officially, and otherwise, reported the results of these researches.

Foxes.—Studies of female silver foxes were correlated with whelping and breeding records. During the breeding season 10 females and 5 males were used for intensive studies on reproduction. Electric-current requirements for killing foxes to be pelted were studied in cooperation with Swarthmore College.

112 *Musk rats.*—Reproductive tracts of 72 male and 55 female muskrats taken during the trapping season were examined and 1,050 histological sections prepared.

Nutritional Studies

Nutritional research on fur animals was conducted cooperatively with the Bureau of Animal Industry of the United States Department of Agriculture and Cornell University. In metabolism experiments with silver foxes and minks, continued from last year with different feeds, minks were found to digest cooked starch and grains more readily than raw; and this trait is being studied also for silver foxes. Foxes digest about 10 percent more of a given feed than minks, probably because of their longer digestive tracts. To establish a normal standard for the comparison of pathological cases, analyses were made of the blood of both foxes and minks.

The principal nutritional problem studied was on the vitamin requirements of fur animals. Preliminary work with adult animals indicated that sufficient body reserve of vitamins A and D may be stored for summer use by spring feeding of diets rich in these vitamins. Results obtained from feeding to adult minks rations containing no vitamin C indicated that this vitamin is not essential for maintenance of their health, but further work is necessary to determine whether fur quality, breeding ability, or special functions are affected by its absence. Other experiments indicate that calcium and phosphorus are essential during the reproduction and lactation periods of foxes and minks and that fur breeders should supply feeds containing sufficient vitamin D.

Fur-fiber Investigations

In cooperation with the Bureau of Animal Industry of the United States Department of Agriculture, much time was devoted to a study of fur fibers. Silver fox and mink furs have three main types of fiber—the underfur and the regular and single guard hairs, and all three types differ from each other in relative length, form, surface structure, and distribution with respect to the follicles.

Through the cooperation of scientists of the Bureau of Standards, an instrument has been constructed for measuring gloss, in order to correlate it with what the eye recognizes as luster.

Technical analysis of the structure of fibers of Karakul and other sheep led to the discovery of smaller units of structure than previously recognized, namely, spherical keratin particles less than 1 micron (one twenty-five thousandth inch) in diameter that may bear pigment and are arranged systematically. The clarification of such minute details of structure is fundamental to the understanding of the gross characteristics of the fibers, which in turn determine the quality of furs.

Karakul Sheep Studies

The Karakul sheep study was continued in cooperation with the Bureau of Animal Industry at the Agricultural Research Center at Beltsville, Md., where the experimental herd produced 59 lambskins. These were cut into halves, half of which were dressed and dyed and the other half left in the raw state to determine the effect that processing has on shape and size of curl, luster, and other qualities. These lambskins were also graded and valued according to standard samples, first by the cooperators and then by fur-trade specialists.

FUR ANIMAL EXPERIMENT STATION, NEW YORK

One of the major problems studied at the Fur Animal Experiment Station, Saratoga Springs, N. Y., was to find cheaper substitutes for meat in the rations of fur animals. This quest becomes more important each year in the case of silver foxes as the prices for pelts are still declining. Beef meal fed in summer was satisfactory and the animals developed good fur. The work demonstrated also that soybean meal can replace the usual weight of beef meal with good results, and the possibility was studied of feeding tripe, udders, lungs, and other packing-house offal. The summer feeding of foxes exclusively on a dry ration in the form of cubes or pellets was tested toward the end of the year. In mink-feeding experiments, canned fish, fishmeal, and tripe were used as substitutes for raw meat and satisfactory results obtained at a much lower cost.

Construction work at the station begun by the W. P. A. was completed, and a new project was begun near the end of the year to provide a residence, additional laboratory facilities, refrigeration unit, heating plant, and new fur-animal pens.

RABBIT EXPERIMENT STATION, CALIF.

That a protein supplement to the grain-hay ration is a necessity for producing rabbits economically was demonstrated by tests with 240 does and 1,636 young rabbits fed for 30 months on peanut, soybean, hempseed, and linseed meals, at the Rabbit Experiment Station, Fontana, Calif. Rations having a narrow nutritive ratio (proportion of digestible protein to total digestible carbohydrates and fats) were found most satisfactory. The pea-sized cake, or pelleted form, of these meals were best adapted for preparing mixtures with grains and for self-feeding.

For 25 months, 48 does and 1,813 young were fed to determine the value of a ration in which cereal grains were limited, and the results proved that feed mixtures for does and litters may consist of one or

more cereal grains properly balanced with the plant protein supplements. Choice of oats, wheat, barley, and sorghum in the feed mixture depends upon the quality and relative cost.

In a 5-year experiment in self-feeding does and litters, now completed, rabbits demonstrated their ability to balance their own rations when given free choice of adequate feeds. Self-fed fryer rabbits, weaned at 56 days of age, averaged 6.8 percent heavier and required 15 percent less feed to produce a unit of gain in live weight than rabbits hand fed a comparable ration.

FUR ANIMAL FIELD STATION, MARYLAND

On the Blackwater Refuge, Maryland, the fur animal field station is developing knowledge on populations, carrying capacity, permissible annual take, breeding season, prime-fur period, and other factors in fur-animal management. A count of the muskrat houses on the 5,248 acres of marsh revealed 26,631 inhabited and 3,947 feed houses. The number of lodges ranged from 3.5 to 9.31 per acre and averaged 5.8. The ratio of feed houses to inhabited lodges was 1 to 6.6.

Extremely cold weather in March delayed the muskrats' breeding period and the growth of plants on the marsh. The first evidence of breeding was noted during the latter part of April, when the green shoots of the three-square also were observed. Litters were born on the marsh at the beginning of April and in pens during the latter part of that month. Two cases of mutation in the brown Maryland muskrat were found, the variety being devoid of guard hairs and having the short underfur wavy and of fine texture and good sheen. Contestants from various States were entered in a muskrat-skinning contest, promoted by the director of the station and held in a theater at Cambridge, Md. The winner removed five pelts in 2 minutes and 38 seconds.

Muskrats and other fur animals are maintained in pens of various sizes and kinds for research purposes. Reproduction in the pens this year was satisfactory, a total of 20 litters being produced. The study to determine the palatability of various feeds for muskrats is being continued. Two female and one male nutria were purchased. A litter was produced and there are now 9 mature animals and 4 young at the station.

WILDLIFE-DISEASE RESEARCH

FUR-ANIMAL DISEASE CONTROL

Research on definite strains of distemper in silver foxes and minks revealed specific qualities of the viruses, tests on the viability of which show a ready susceptibility to injury by light and ordinary

drying; rapid freezing at low temperatures in vacuo, however, permits storage of specific strains with retention of virulence. Advantage was taken of this proved susceptibility of the virus to natural destruction in the eradication of disease from ranches by temporarily protecting all the stock with homologous serum until no live virus remained.

Control of outbreaks of paratyphoid in silver fox herds has been simplified by use of commercial livestock paratyphoid vaccine. Previously it had been considered safe to use only an autogenous product developed from the particular strain existing in the herd to be treated.

Study of a new disease in minks, known as "cotton" mink, showed that the under fur assumes a pale shade, almost white, making the pelt practically worthless. A relationship between the defective pelage and the abnormal functioning of the digestive process was noted in affected animals.

GAME-BIRD DISEASES

Through extensive use of the Winkler method of oxygen determination and toxicity tests with experimental animals, a close relationship between oxygen depletion and outbreaks of botulism in waterfowl was demonstrated. Tests showed that this reduction in oxygen is brought about by the growth of aerobic organisms during the early stages of decay of plant and animal matter on the shore lines of lakes. Experiments are being conducted with various devices for instilling oxygen into the water to inhibit the multiplication of the botulinus organisms.

PHYSICAL PROPERTIES OF QUAIL FEEDS STUDIED

Extensive losses among young pen-raised quails were shown to be due to excessive quantities of fiber causing impaction in the digestive canal. This finding makes it evident that nutritive values alone are not to be relied upon in developing a ration for young quails but that the physical properties of feeds also must be given careful consideration.

INFECTIOUS DISEASES IN BIG GAME

Assistance was given the Forest Service of the United States Department of Agriculture in diagnosing an outbreak of hemorrhagic septicemia in deer and making recommendations for its control. In numerous autopsies, the bipolar germ characteristic of the disease was demonstrated in the blood.

In cooperation with the Bureau of Animal Industry of the United States Department of Agriculture and the veterinary staff at Fort Sill, Okla., diagnosis was made of Bang's disease in the buffaloes and long-horned cattle on the Wichita Refuge on the basis of the blood tests. Control by vaccinating the young stock was recommended.

RESEARCH ON NATIONAL PARK WILDLIFE

WILDLIFE RELATIONSHIPS

On January 1, 1940, the wildlife research work formerly done by the National Park Service was transferred to the Bureau of Biological Survey, by direction of the Secretary. Since that date, continuing work begun several years ago, major emphasis has been placed upon investigations of prey-predator ecology. Field work was centered on wolf-sheep problems in Mount McKinley National Park, Alaska, to which a biologist who spent 7 months there in 1939 returned for a second season. His laboratory studies of field material, carried on during the winter, have not progressed far enough to warrant publication of conclusions, but they indicate that climatic and range conditions are greater factors than predation by wolves in the fluctuations of the Dall sheep populations.

A closer coordination among all research agencies working on bighorn sheep in the Rocky Mountains was effected through agreements between the National Park Service, the Grazing Service, and the Bureau of Biological Survey, of this Department, the Forest Service, of the Department of Agriculture, and the States concerned. A consequent improvement in assembling and distributing data has resulted in more effective efforts to conserve this endangered species. Contribution from national park areas to this cooperation has come from Rocky Mountain National Park, Colo., where the dietary and mineral requirements of bighorns are being investigated; from Yellowstone National Park, Wyo., where migration and range are being studied by the naturalist staff; and from the Glacier National Park, Mont., where the regional biologist and the park staff are making observations upon lambing-range requirements and improvement. Inventories in Death Valley National Monument, Calif., show a gradual improvement in the status of the Nelson bighorn but indicate a need for eliminating stray cattle and burros. Similar range competition is found to be imminent on the Boulder Dam National Recreational Area, Nev. Studies in the Organ Pipe Cactus National Monument, Ariz., show that distribution of water holes may be the present limiting factor in the conservation of the Gaillard bighorn.

Other inventories included a survey of the botanical resources of Mount McKinley National Park, through cooperation of the Univer-

sities of Wyoming and Alaska; preliminary surveys in California of wildlife on the new Channel Islands and Joshua Tree National Monuments, and in Utah, at Capitol Reef National Monument.

Other research projects included a study of mosquito-control methods on national park areas in the Southeastern States, resulting in recommendation of pyrethrum in preference to fuel oil as a larvicide; studies of reported overpopulations of deer on the Hickory Run Recreational Demonstration Area, Pa., and of deer, wild turkeys, and raccoons on the Colonial National Historical Park, Va.; appraisal of wildlife habitats along the Blue Ridge Parkway; investigation of mixed-type habitats versus solid forests in southeastern areas; continuance of surveys of the trumpeter swan in Yellowstone National Park; and observations of forage utilization by elk, deer, bighorns, and beavers in Rocky Mountain National Park.

RANGE-IMPROVEMENT STUDIES

Investigations of methods for improving forage conditions were continued in Rocky Mountain National Park, where the effect of heavy elk browsing, especially on aspen, is being studied in relation to use of the same food by deer and beavers. Resultant recommendations for a reduction in the size of the elk herd are now being carried out by the National Park Service. Long-term range studies were also continued by the use of exclusion plots on the floor of Yosemite Valley, Calif., where deer are numerous; and in Zion National Park, Utah, where a recommendation for the removal of about 50 surplus deer has been made. Overbrowsing by deer was investigated also in several small eastern areas, including Hickory Run and French Creek Recreational Demonstration Areas, Pa., and Colonial Historical Park, Va. In the Pennsylvania areas overbrowsing will be corrected or prevented under a recent agreement, approved by the Secretary, whereby the National Park Service and the State Game Commission will cooperate in regulated hunting on such demonstration areas as require management measures to preserve recreational values; in Virginia overabundance of deer in the Colonial Park is being handled in cooperation with the State by live trapping surplus animals and transplanting them to understocked sections.

Dual use of range by wildlife and domestic stock was investigated in several national park areas where to avoid hardship to cattlemen land-acquisition agreements provide for a continuance of grazing for a limited period. As a result of these studies the following management practices have been adopted by the National Park Service:

Through an agreement with the Grazing Service, approved by the Secretary on February 20, 1940, grazing privileges are being expedi-

tiously handled by fieldmen of both services on the basis of gradual reduction and eventual elimination on Carlsbad Caverns National Park addition, N. Mex.; Grand Canyon National Monument, Ariz.; Zion National Monument, Utah; and Dinosaur Monument addition, Utah and Colorado. Areas adjacent to forest reserves, including Bryce Canyon National Park, Utah, and Kings Canyon National Park, Calif. are receiving similar tapering-off management. Other plans affecting grazing contemplate the eventual removal of saddle horses from a big-horn lambing ground in Glacier National Park; elimination of stray cattle and feral burros from important bighorn ranges in the Death Valley National Monument; and improvement of water holes for antelopes in the White Sands National Monument, N. Mex.

BIOLOGICAL SURVEYS AND WILDLIFE INVENTORIES

In Sequoia National Park, Calif., a comprehensive faunal survey has been completed and a report on the field work partly prepared for publication. Field and laboratory work on a similar survey of the new Kings Canyon National Park was begun in the spring. Improvements in making and recording annual wildlife inventories in the national parks have rendered the data more usable in management and publicity projects. The results of the improved inventory were published in Conservation Bulletin 3, Wildlife Conditions in the National Parks: 1939.

FEDERAL AID IN WILDLIFE RESTORATION

The satisfactory progress under the Federal Aid to Wildlife Restoration Act (50 Stat. 917), commonly known as the Pittman-Robertson Act, was continued and expanded during its second year of operation. Having become better acquainted with its provisions, the States have been able to engage in well-studied restoration programs designed for the most part to benefit all sections, and their activities have already accomplished much for wildlife. Information on the program and the text of the law and regulations were published in Wildlife Circular 3.

All 43 of the eligible States (5 have not enacted the necessary legislation to provide for their participation—Florida, Georgia, Louisiana, Montana, and Nevada) are now engaged in wildlife-restoration projects, the nature of which varies greatly. Some of the Eastern and Southern States have acquired large tracts to provide additional sanctuaries for deer, wild turkeys, ruffed grouse, and fur animals. Western States have emphasized the purchase of winter range for deer, elk, and other big-game species, and the provision

of additional water facilities for prairie chickens and sage grouse. Many States have inaugurated State-wide wildlife-resource surveys to inventory wildlife populations and ascertain limiting factors with the view of inaugurating better management procedures.

The conduct of these projects has afforded employment to a number of graduates of colleges that offer wildlife-management courses. The States find it advantageous to use trained personnel in their wildlife work, and the training courses available are recruiting others to careers in wildlife management. In their wildlife-restoration activities the States report splendid cooperation by other governmental agencies, including the Forest Service, Agricultural Adjustment Administration, Civilian Conservation Corps, Soil Conservation Service, Grazing Service, Bureau of Indian Affairs, and National Park Service.

Of the funds appropriated in 1939, the \$546,068 not expended was available for obligation, together with the current appropriation of \$1,500,000, of which \$1,400,000 was directly apportioned to the States. The Federal funds available for the States during 1940 thus amounting to \$1,946,068 were increased by the required 25-percent State contributions to \$2,594,757. The money is apportioned for wildlife-restoration projects on the basis of the land area and the number of hunting-license holders in each State. All costs of undertakings are borne by the State game departments, after which reimbursement is made from Federal funds for the Government's pro rata share, which may not exceed 75 percent of the total.

Approval of projects is limited to those of substantial character and design and of benefit to wildlife. The year's restoration program involved the obligation by the States of \$2,082,735 on 237 individual restoration projects—51 for the acquisition of land and water for wildlife, at an estimated cost of \$487,512; 101 for the development of land and water to improve wildlife conditions, at a cost of \$713,953; and 85 for the investigation of wildlife conditions and their relationship to existing agricultural and land-use practices, at an expenditure of \$881,270. The features of the restoration activities grouped for each State are shown in table 3.

The States cooperating plan to continue their programs for 1941 under the increased funds made available (Congress appropriated \$2,500,000). It is anticipated that the restoration program will be extended and expanded in proportion to this increase and to the increased ability of the game departments through experience gained in operations during the past 2 years.

TABLE 3.—Nature of the 1940 Federal-Aid-In-Wildlife Restoration Projects and the Estimated Cost

State; and total funds available	Purpose of project	Estimated cost
Alabama----- \$46,015.	To inventory the principal wildlife species-----	\$27, 120
Arizona----- \$63,851.	To establish muskrats and beavers in coastal marshes and streams-----	2, 134
	To survey the wildlife resources-----	44, 869
	To restore quails in suitable habitats-----	4, 356
	To establish beavers on forest lands-----	946
	To introduce pheasants in irrigated valleys of the Gila, Salt, and Verde River watersheds-----	1, 837
Arkansas----- \$35,019.	To restore wild turkeys in national forests-----	2, 174
	To construct headquarters facilities on State game lands in Howard County-----	15, 150
California----- \$127,858.	To establish wild turkeys on State game refuges-----	5, 500
	To study the management of the valley quail in the southern counties-----	7, 252
	To develop existing water supplies for quails and create new ones in desert areas-----	15, 000
	To restore springs, water holes, and habitat for sage grouse-----	10, 000
	To study limiting factors on mule deer in southern counties-----	12, 000
	To inventory the fur resources-----	9, 704
	To conduct a comprehensive study of beavers and their management-----	1, 600
Colorado----- \$76,980.	To survey the wildlife resources-----	29, 611
	To purchase deer winter-feeding area in Rio Blanco County-----	2, 150
	To acquire winter-feeding area for deer and elk in Gunnison County-----	20, 190
	To fence the Wray Upland Bird Refuge for prairie chickens, quails, and pheasants and improve the habitat-----	1, 615
	To purchase Hot Sulphur deer-elk winter-feeding grounds-----	3, 325
	To provide water facilities on Great Divide sanctuaries-----	3, 482
	To purchase big-game winter-feeding area on Frying Pan River, Eagle County-----	8, 150
Connecticut----- \$8, 574.	To study ruffed grouse management-----	4, 200
	To fence the Scoville Wildlife Sanctuary for pheasants, grouse, and rabbits and improve the habitat-----	922
Delaware----- \$4,685.	To determine the value of seed-stock areas in maintaining wildlife-----	4, 659
Florida----- \$41,990.		(¹)
Georgia----- \$44,651.		(¹)
Idaho----- \$61,206.	To determine populations and distributions of the more important wildlife species-----	41, 936
	To purchase the Hagerman Valley Waterfowl Refuge-----	18, 045
	To improve waterfowl conditions on the Hagerman Valley Refuge-----	5, 302
	To purchase the Idaho County Bird Refuge-----	1, 130
	To fence and post the Idaho County Refuge and improve the wildlife habitat-----	684
	To purchase the Nez Perce Bird Refuge-----	1, 130
	To fence and post the Nez Perce Refuge-----	1, 665
	To develop 8 waterfowl areas for sage grouse in Lincoln and Minidoka Counties-----	3, 296
	To develop springs and water seeps for sage grouse-----	1, 048
	To reclaim 4 springs in Owyhee County for wildlife-----	1, 933
	To improve 3 springs for sage grouse and antelopes-----	1, 200
	To establish beavers in mountain streams in forest regions-----	14, 775
	To establish Hungarian partridges on depleted areas-----	1, 375
	To introduce pheasants on suitable depleted areas-----	2, 525
	To post 40 State refuges-----	3, 500
Illinois----- \$89,678.	To study upland-game management-----	3, 860
	To develop seed-stock refuges on farms-----	13, 603
	To investigate squirrels and raccoons-----	3, 725
	To study food supplies of upland game birds-----	2, 618
	To develop Horseshoe Lake for geese-----	12, 004
	To fence upland-game study areas and improve the wildlife habitat-----	2, 777
	To survey and select prairie areas suitable for conducting wildlife-management studies-----	2, 600
	To purchase the Green River Waterfowl and Upland Game Refuge-----	49, 837
Indiana----- \$113,933.	To fence the Hovey Lake Refuge and construct headquarters buildings and stabilize water levels-----	14, 365
	To conduct State-wide wildlife survey and game-management demonstration-----	38, 250
Iowa----- \$57,838.	To purchase the Rice Lake waterfowl and upland game area-----	30, 362
Kansas----- \$58,012.	To fence and post the Kingman County State Game Preserve and improve the habitat for pheasants, quails, and waterfowl-----	7, 881
	To stabilize water levels on the Republic County State Game Preserve-----	2, 500
	To fence the Finney County State Game Preserve for buffaloes and for lesser prairie chickens and other game birds-----	6, 791
	To restore and manage pheasants-----	15, 000

¹ Ineligible to participate.

TABLE 3.—Nature of the 1940 Federal-Aid-In-Wildlife Restoration Projects and the Estimated Cost—Continued

State; and total funds available	Purpose of project	Estimated cost
Kentucky..... \$41,703.	To purchase the Flatwoods Deer and Turkey Refuge..... To develop the Flatwoods Refuge..... To develop Harlan wildlife area for deer and turkeys.....	\$6, 070 2, 202 2, 572 (¹)
Louisiana..... \$40,844.		
Maine..... \$37,844.	To determine means of developing the State's 2,500 lakes for waterfowl, fur animals, and other wildlife. To establish aquatic food and cover plants in some of the lakes.....	8, 535 19, 275
Maryland..... \$20,313.	To acquire the Indian Springs Game Refuge for quails, turkeys, rabbits, and squirrels. To fence and post the Indian Springs Refuge and improve the wildlife habitat. To fence and post wildlife-refuge parts of State forests and improve the wildlife habitat.	11, 114 3, 400 3, 250
Massachusetts..... \$20,016.	To conduct a comprehensive study of pheasant management on test and check areas. To investigate winter range and food conditions for black ducks and Canada geese. To develop areas on the Federation of Women's Club State Forest for rabbits, deer, and ruffed grouse. To improve wildlife conditions in the Windsor State Forest..... To improve wildlife conditions in the Hawley State Forest..... To improve wildlife areas for deer in the Myles Standish State Forest..... To ascertain habitat requirements of ring-necked pheasants..... To study habitat requirements of fox squirrels..... To study survival and behavior of Hungarian partridges..... To study ecological successions after forest fires..... To study coordination of wildlife with agricultural practices by practical experiments. To ascertain range competition between sharp-tailed grouse and prairie chickens. To study practical raccoon management..... To purchase an upland-game area in Barry County..... To purchase upland-game lands in Tuscola County..... To purchase lands for the Rose Lake Wildlife Experiment Station..... To fence and post the Red Lake Refuge..... To post 114 State game refuges..... To reestablish quails and pheasants on State refuges..... To improve wildlife conditions for deer, turkeys, and beavers in national forests. To fence the H. B. Cole Refuge, improve the wildlife habitat, and reestablish deer and turkeys. To fence the Leroy Percy Refuge and improve the wildlife habitat..... To determine populations and distribution of the wildlife resources..... To conduct a survey of the wildlife resources..... To purchase lands for deer and turkeys in the Ozark Mountains..... To fence and post the Caney Mountain Refuge in the Ozarks and improve conditions for deer and turkeys.	8, 000 6, 000 600 350 1, 250 1, 200 6, 920 5, 330 7, 158 8, 500 10, 345 5, 500 4, 000 31, 345 16, 605 10, 125 4, 173 24, 803 17, 754 4, 712 13, 793 9, 111 11, 979 55, 500 9, 437 9, 938
Michigan..... \$173,878.		(¹)
Minnesota..... \$90,406.		
Mississippi..... \$47,257.		
Missouri..... \$69,467.		
Montana..... \$91,505.		
Nebraska..... \$70,084.	To increase and establish ring-necked pheasants..... To restore and improve conditions for quails.....	19, 868 26, 087 (¹)
Nevada..... \$57,714.		
New Hampshire..... \$15,902.	To study ruffed grouse populations, needs, limiting factors, and management. To improve food and cover on experimental grouse-management areas..... To ascertain populations, species, and conditions of ducks..... To study and improve conditions for pheasants, grouse, ducks, and fur animals.	12, 869 4, 246 835 3, 000
New Jersey..... \$32,316.	To lease seed-stock refuges in Somerset County for pheasant and rabbit management. To acquire areas for deflecting deer from agricultural lands..... To study the condition of cottontail rabbits and recommend future management. To ascertain the value of seed-stock refuges for pheasants..... To improve food and cover on Somerset County seed-stock refuges..... To acquire 2 prairie chicken and quail refuges in Roosevelt County..... To fence the 2 Roosevelt County refuges and improve the water facilities..... To reestablish the antelope..... To improve water supplies for bighorn sheep..... To purchase 2 refuges in Taos County for sage grouse..... To purchase a refuge for wild turkeys, waterfowl, fur animals, and deer in Sandoval County.	1, 037 941 2, 279 5, 503 4, 428 6, 481 4, 072 8, 272 2, 420 8, 534 5, 506
New Mexico..... \$67,275.		

¹ Ineligible to participate.

TABLE 3.—Nature of the 1940 Federal-Aid-In-Wildlife Restoration Projects and the Estimated Cost—Continued

State; and total funds available	Purpose of project	Estimated cost
New York..... \$169,676.	To post seed-stock refuges for farm game and improve the food and cover....	\$10, 829
	To lease seed-stock refuges for farm game.....	14, 446
	To plant trees and shrubs on State lands for food and cover for deer, ruffed grouse, and cottontail rabbits.....	7, 436
	To construct a pathological laboratory at the Delmar Research Center.....	27, 206
North Carolina..... \$59,755.	To study effective management practices for important species of game.....	53, 956
	To develop the 70,000-acre Holly Shelter Wildlife Refuge.....	56, 920
	To acquire lands for access to the Holly Shelter Refuge and for a headquarters site.....	7, 357
	To survey farm-game management practices under field conditions.....	13, 581
	To survey conditions for and to evaluate the fur resources.....	8, 493
	To improve food and cover on the 40,000-acre Sandhills Wildlife Refuge.....	1, 826
	To construct small water impoundments on the Sandhills Refuge.....	9, 583
	To improve food and cover for deer and turkeys on the John Pickett Council Refuge.....	724
North Dakota..... \$39,423.	To fence the Dawson Refuge and improve cover and provide water.....	4, 631
	To provide food and cover for waterfowl, Hungarian partridges, sharp-tailed grouse, and pheasants on the Cedar Lake Refuge.....	1, 500
	To fence and post the Morton County Refuge and improve water conditions.....	1, 769
	To purchase the Dawson Refuge.....	3, 340
	To survey the wildlife resources.....	12, 300
Ohio..... \$133,857.	To survey the wildlife resources and correlate game management and existing agricultural practices.....	38, 500
	To conduct grouse management and improve environment on Jackson County lands.....	2, 188
	To study comprehensively grouse-management practices on selected areas.....	13, 953
	To conduct grouse management on 1,400 acres in Washington County.....	2, 625
Oklahoma..... \$54,386.	To restore and manage the bobwhite quail.....	42, 630
	To survey the wildlife resources.....	46, 435
Oregon..... \$66,042.	To establish seed-stock refuges for small game in the Willamette Valley.....	7, 862
	To reseed parts of the Tillamook burn.....	3, 000
	To establish and manage beavers.....	10, 301
	To develop water supplies and habitat for sage grouse.....	8, 060
Pennsylvania..... \$157,902.	To study forest-wildlife relations.....	11, 385
	To study ecological conditions best suited for pheasants, Hungarian partridges, rabbits, and quails.....	5, 885
	To study native fur animals.....	7, 625
	To study the relationship of nutrition to reproduction among white-tailed deer.....	7, 350
	To conduct an economic survey of muskrats, skunks, and foxes.....	5, 850
	To recondition headquarters buildings at the Loyalsock Experiment Station.....	2, 850
	To purchase 20 additional tracts for State game lands.....	71, 155
Rhode Island..... \$2,501.	To investigate practicable game management.....	2, 245
South Carolina..... \$34,890.	To reestablish quails on improved areas in the Sumter National Forest.....	2, 060
South Dakota..... \$46,118.	To reestablish quails on improved areas in the Poinsett State Forest.....	19, 259
	To purchase lands for the Gherkin Refuge for waterfowl, pheasants, and Hungarian partridges.....	6, 199
Tennessee..... \$36,659.	To purchase the Buffalo Slough Waterfowl Refuge.....	12, 361
	To acquire land for an upland-game refuge.....	17, 021
Texas..... \$158,632.	To fence the Cheatham County Refuge and provide deer-seed stock.....	5, 414
	To investigate desert bighorns.....	4, 969
	To survey the wildlife resources.....	131, 055
	To restore the collared peccary.....	1, 086
	To improve habitat for quails and reestablish the birds in depleted covers.....	24, 255
	To establish the antelope on suitable depleted ranges.....	2, 530
	To restore white-tailed deer and wild turkeys on suitable depleted ranges.....	8, 202
Utah..... \$54,433.	To study the relationship of beavers to stream run-off.....	1, 500
	To purchase deer winter-feeding area in Box Elder County.....	10, 185
	To study summer and winter feeding conditions for mule deer.....	11, 410
	To purchase land and water rights for improving the Provo Bay Waterfowl Refuge.....	2, 115
	To purchase the Cache experimental winter-feeding area for deer.....	2, 000
	To improve waterfowl conditions in Ogden Bay by water impoundment.....	25, 860
	To purchase lands in Millard County for deer winter range.....	8, 591
Vermont..... \$14,835.	To survey the wildlife resources.....	4, 000
	To study deer management.....	1, 264
	To survey the fur resources along Lake Champlain.....	926
Virginia..... \$50,527.	To survey the wildlife resources.....	27, 000
	To study the effect of forest clearings on wildlife.....	3, 400
	To restore wild turkeys on protected areas.....	5, 000
	To restore deer in the George Washington and Thomas Jefferson National Forests.....	19, 798
	To restore the quail in counties east of the Blue Ridge Mountains.....	7, 220

TABLE 3.—Nature of the 1940 Federal-Aid-In-Wildlife Restoration Projects and the Estimated Cost—Continued

State; and total funds available	Purpose of project	Estimated cost
Washington..... \$80,414.	To purchase lands for the Sinlahekin Deer Refuge.....	\$22,286
	To protect the Sinlahekin Refuge from grazing by constructing fences and cattle guards.....	565
	To purchase an antelope range in Kittitas County.....	17,565
	To fence and post the Squaw Creek Antelope Range and improve the habitat.....	5,239
West Virginia..... \$51,161.	To purchase an elk range in Yakima County.....	3,554
	To purchase the Panther Creek deer and turkey refuge in McDowell County.....	37,647
	To survey the wildlife resources.....	20,000
	To reestablish deer on State refuges.....	9,735
	To post, brush out boundaries, afford fire protection, and construct headquarters on the Nathaniel Mountain Wildlife Refuge.....	5,116
	To fence and post the Braxton County Game Refuge and construct headquarters buildings.....	6,183
Wisconsin..... \$81,442.	To post 6 State wildlife refuges.....	1,375
	To study management problems of white-tailed deer.....	8,800
	To study conditions for sharp-tailed and pinnated grouse and the management problems.....	8,350
	To ascertain ways of improving waterfowl conditions.....	4,600
	To survey pheasant populations and conditions.....	9,400
	To study quail populations and the influence on them of climatic conditions.....	200
Wyoming..... \$53,863.	To survey and restore sage grouse.....	13,236
	To ascertain factors determining the abundance of bighorns.....	7,350
	To purchase 2 winter-feeding areas for elk.....	10,176

ACQUISITION OF LAND FOR REFUGES

Following approval by the Migratory Bird Conservation Commission of proposed acquisitions, 159 separate tracts, comprising 59,898 acres, were added to 20 existing national wildlife refuges throughout the country. These approvals involved relatively small units needed within existing boundaries to facilitate administration. Executive orders for the establishment of the Noxubee, Miss., and the Bosque del Apache, N. Mex., Refuges, for the enlargement of 4 existing refuges, and for one revocation involved 667.23 acres of public domain and 105,967.05 acres acquired by purchase. Details of the accomplishments in refuge-land acquisition are given in table 4.

Surveys were made of 294 miles of boundary lines and of 110 miles of interior or contiguous lines required by reason of lost and obliterated corners; 48 miles of level lines were run; 373 miles were marked to define the boundaries of existing refuges; and 115 miles of boundary lines were staked preliminary to fence construction. Survey descriptions necessary for title examinations and preparing deeds of conveyance for 827 tracts were completed for approximately 22,377 acres, of which 242 tracts of 8,356 acres with irregular boundaries were surveyed preliminary to the preparation of definitive land descriptions. Topographic surveys of 180 acres were made and detailed maps compiled therefrom.

TABLE 4.—Tracts, in acres, acquired or in process of acquisition for national wildlife refuges and related uses under the Migratory Bird Conservation Act, with emergency and other funds, and by gift and Executive order or proclamation

State and county	Refuge	Fiscal year 1940						Acquired in pre-vious years
		Under Migratory Bird Con-servation Act		With emergency and other funds		Acquired other than by purchase	Total	
		Acquired by pur-chase	Pending title con-veyance	Total	Acquired by pur-chase			
Arizona: Mohave	Boulder Canyon (see also Nevada)	271	5,293	5,564	160	1,312	5,876	312,047
Arkansas: Arkansas, Desha, Monroe, and Phillips	White River							2 102,250
Delaware: Kent	Bombay Hook	4	1,630	1,634			1,634	12,006
Florida: Jefferson, Taylor, and Wakulla	St. Marks		1,803	1,803		11,884	13,687	2 49,640
Georgia: Jasper and Jones	Piedmont					1,326	1,326	2 28,674
Idaho: Jefferson	Camas		296	296			296	10,239
Illinois: Mason	Chautauqua		31	31		271	302	4,100
Carroll, Jo Daviess, Rock Island, and Whiteside	Upper Mississippi (see also Iowa, Minnesota, and Wisconsin)							5,256
Iowa: Kossuth	Union Slough	256	106	362			362	730
Allamakee, Clayton, Clinton, Dubuque, Jackson, and Scott	Upper Mississippi (see also Illinois, Minnesota, and Wisconsin)							24,441
Kentucky: Lyon and Trigg	Kentucky Woodlands				238	2,677	2,915	2 46,090
Louisiana: Plaquemines	Delta		7,172	7,172	8,711	3 8,711	15,883	2 34,300
Cameron	Sabine		438	438			438	147,340
Maine: Washington	Moosehorn	439	3,658	4,097			4,097	2 47,165
Maryland: Anne Arundel and Prince Georges	Patuxent	432		432			432	2,693
Cecil and Harford	Susquehanna (closed area)							
Massachusetts: Barnstable	Monomoy		322	322			322	
Michigan: Schoolcraft	Seney	7,419	10,672	18,091			18,091	2 68,067
Minnesota: Aitkin	Rice Lake	1,281	307	1,588	157	3 157	1,745	9,714
Becker	Tamarac	40	8,974	9,014			9,014	22,914
Houston, Wabasha, and Winona	Upper Mississippi (see also Illinois, Iowa, and Wisconsin)					2 2,493	2,493	14,478
Mississippi: Noxubee, Oktibbeha and Winston	Noxubee						38,239	
Missouri: Stoddard and Wayne	Mingo		25,000	25,000			25,000	
Chariton	Swan Lake	566	883	1,449			1,449	9,221

TABLE 4.—Tracts, in acres, acquired or in process of acquisition for national wildlife refuges and related uses under the Migratory Bird Conservation Act, with emergency and other funds, and by gift and Executive order or proclamation—Continued

State and county	Refuge	Fiscal year 1940						Acquired in previous years
		Under Migratory Bird Conservation Act			With emergency and other funds			
		Acquired by purchase	Pending title conveyance	Total	Acquired by purchase	Pending title conveyance	Total	
Wisconsin:								
Juneau.....	Necedah.....							2,564
Buffalo.....	Upper Mississippi (see also Illinois, Iowa, and Minnesota).							54,502
Crawford, Grant, La Crosse, Trempealeau, and Vernon.....								
Wyoming: Teton.....	Elk Refuge.....	960	320	1,220				1,220
Total.....		21,717	115,151	136,868	19,852	93,979	113,831	310,154
								(10)

² Corrected since last year.

⁴ Acquired and in process of acquisition by the Farm Security Administration; originally intended for agricultural demonstration areas, but transferred to the Biological Survey.

⁷ Upper Mississippi River Wildlife and Fish Refuge fund.

¹⁰ Total omitted, as entries in column are for only those refuges on which acquisition work was involved during the year.

NOTE.—1-acre items range from a fraction of an acre to 1.49 acres.

THE NATIONAL WILDLIFE REFUGE PROGRAM

The number of national wildlife refuges under the jurisdiction of the Biological Survey was increased by three, and much was accomplished in making the whole system more serviceable to wildlife. Under the improvement program, aided by C. C. C., W. P. A., and N. Y. A. labor agencies, a general increase was again noted in the number of birds and other wildlife using the refuges.

ADMINISTRATION AND MANAGEMENT OF REFUGES

The Biological Survey now administers 263 refuges (13,635,365 acres) (table 5), the 247 in the United States covering 9,541,163 acres and the 16 in Alaska, Hawaii, and Puerto Rico, 4,094,202 acres. It also administers 18 areas (12,417 acres) for experimental and administrative purposes, on which wildlife is protected.

The following 8 refuges (1,617,993 acres) were placed under active administration: Cabeza Prieta and Kofa, Ariz; Salton Sea, Calif.; Susquehanna, Md.; Brigantine, N. J.; and Lake Ilo, Lake Ardoch, and Long Lake, N. Dak. In addition, the 68 easement refuges in North Dakota (111,857 acres) were divided into districts and placed under the supervision of the personnel of 5 nearby refuges.

TABLE 5.—Classification and Acreage of National Wildlife Refuges Administered by the Bureau of Biological Survey

Classification	Number	Acres
For migratory waterfowl.....	176	3, 447, 218
For other migratory birds, small upland game, fur animals, and other wildlife.....	24	3, 475, 903
For colonial nongame birds.....	50	107, 666
For big game.....	13	6, 603, 578
Total.....	263	13, 635, 365

Custodianship was assigned to the Biological Survey of six wildlife-management areas, former Resettlement Administration projects, covering 276,404 acres, in the following States: Minnesota (Beltrami Island), Missouri, New York, North Carolina, South Carolina (Carolina Sandhills), and Wisconsin (Necedah). Actual administration is under a State agency, usually the department of conservation, but the Biological Survey will serve in an advisory capacity and review wildlife-management plans before adopted.

At the end of the year, exclusive of the easement refuges, 91 refuges (10,648,620 acres) were being operated by a staff of 223 permanent and 32 part-time (temporary) employees. The cost of maintaining the refuges has increased materially with the placing of additional refuges under active administration, but even more with the comple-

tion of the C. C. C. and W. P. A. development work on several refuges, which necessitates maintenance from regular appropriations.

Bird Refuges

New refuges.—Three important refuges were added during the year—the Susquehanna Migratory Waterfowl Closed Area, Harford County, Md.; the Noxubee National Wildlife Refuge, Winston, Noxubee, and Oktibbeha Counties, Miss.; and the Bosque del Apache National Wildlife Refuge, Socorro County, N. Mex.

The Susquehanna area (21,210 acres) was closed under the Migratory Bird Treaty Act by Presidential proclamations of August 24, 1939, and January 24, 1940, to protect all forms of wildlife, especially canvasback and other ducks, which there find an excellent resting and feeding ground.

The Noxubee Refuge (about 40,000 acres) was established by Executive order of June 14, 1940, to protect wild turkeys, waterfowl, muskrats, and other wildlife.

The Bosque del Apache Refuge (55,972 acres) was established by Executive order of November 22, 1939, because of its value as a resting and feeding area for waterfowl during migration. Many birds spend the winter on the area and some nest there.

Increased use by wildlife.—The waterfowl and other wildlife on the national wildlife refuges showed a substantial increase in numbers for the fourth consecutive year, as a result of improved water, food, and cover conditions and more adequate protection. In addition, some species not seen on the refuges since their establishment were observed.

In North Dakota at least 150,000 ducks were produced on the Lower Souris Refuge, and 50,000 on the Des Lacs Refuge, in both cases substantial increases over previous years. For the first time since the establishment of the Lower Souris Refuge at least two pairs of wild unpinioned Canada geese, thought to be offspring of captives, nested there on artificial islands. The number of beavers on this refuge increased to 459 from the initial stock of 50 in 1935.

On the Sand Lake Refuge, S. Dak., more than 40,000 nests of Franklin's gull were found, compared with 20,000 in 1939, 6,100 in 1938, and 6,000 in 1937—the first year this species nested there—and at least 2,000,000 ducks stopped during the fall migration, a great increase over the previous years. On a floating island in the display pond a pair of wild Canada geese nested, the second nesting record since the establishment of this refuge, one brood having been hatched in 1939.

On the Mud Lake Refuge, Minn., 500 ruddy ducks nested, compared with about 50 each previous year since 1937, when the refuge was established.

The waterfowl stopping on the Necedah Refuge, Wis., during the spring migration was more than double the number present the previous spring. A maximum of 125,000 ducks wintered on the Savannah Refuge, Ga. and S. C. On the Muleshoe Refuge, Tex., the number of wintering ducks increased 400 percent and of Canada geese 250 percent over the previous year. Ten shoveler eggs on the Seney Refuge, Mich., provided not only the first nesting record of this duck for the refuge but probably for the entire Upper Peninsula.

On the Deer Flat Refuge, Idaho, at the peak of the fall migration there were about 200,000 pintails and 800,000 mallards, an increase of 100 percent over the preceding year. Snowy plovers seen on the Sacramento Refuge, Calif., established a new record for the refuge and its vicinity. Three new nesting records—western grebe, Brewster's egret, and white-faced glossy ibis—were established at the Salton Sea Refuge, Calif.

At the Bowdoin Refuge, Mont., three black ducks treated for botulism late in the summer gave the first observation of this species on the area; their occurrence in the vicinity is rare. The small herd of antelopes on this refuge, which numbered only 7 in 1935, was increased in 1939 to 27, when 10 fawns were born; the number born in 1940 is not yet known, but an increase of about 15 is indicated.

More than 1,300 geese of 4 species (Canada, white-fronted, lesser snow, and blue) remained all winter on the Lacassine Refuge, La., for the first time since its establishment. No accurate estimate could be made of the numbers of blue and snow geese that wintered on the Sabine Refuge, La., but on several areas closely packed flocks extended 1 mile long and 300 yards wide. There were flocks of blue and snow geese ranging from 40 to 200, on the Wheeler Refuge, Ala., during the fall migration, an unusual occurrence, since these birds rarely go so far east of the Mississippi Flyway. Canada and lesser snow geese were much more abundant on the Malheur Refuge, Oreg., in the fall than in previous years. Whistling swans stopped for the first time on the Bombay Hook Refuge, Del.

An encouraging increase in the number of trumpeter swans on the Red Rock Lakes Refuge, Mont., and its vicinity was revealed by a count made late in the summer of 1939. This showed for the refuge proper, 59 cygnets, or young birds, and 50 adults; for nearby lakes, 20 adults; and for the Yellowstone National Park, 17 cygnets and 53 adults—a total of 199 (76 cygnets and 123 adults), compared with 148 in the summer of 1938, and 158 in the summer of 1937.

Big-game Preserves and Ranges

The numbers of big-game animals on the Bureau's fenced preserves are given in table 6.

TABLE 6.—Animals on Fenced Big-game Preserves Maintained by the Bureau of Biological Survey (Estimated)

ANIMALS AS OF JUNE 30, 1940

Preserve	Buffalo	Elk	Antelope	Bighorn sheep	Deer		Texas longhorn	Total
					White-tailed	Mule		
National Bison Range, Mont.....	437	48	-----	17	36	100	-----	628
Fort Niobrara National Wildlife Refuge, Nebr.....	148	37	-----	-----	8	5	24	222
Sullys Hill National Game Preserve, N. Dak.....	13	14	-----	-----	16	-----	-----	43
Wichita Mountains Wildlife Refuge, Okla.....	497	202	32	-----	799	-----	171	1,701
Total.....	1,095	301	32	7	859	105	195	2,594

YOUNG BORN IN CALENDAR YEAR 1939

National Bison Range, Mont.....	95	18	-----	8	12	26	-----	159
Fort Niobrara National Wildlife Refuge, Nebr.....	30	11	-----	-----	2	-----	4	47
Sullys Hill National Game Preserve, N. Dak.....	7	8	-----	-----	2	-----	-----	17
Wichita Mountains Wildlife Refuge, Okla.....	112	30	7	-----	50	-----	27	226
Total.....	244	67	7	8	66	26	31	449

¹ All but this number were transferred to the Hart Mountain Antelope Refuge, Oreg.

Kofa and Cabeza Prieta Game Ranges, Ariz.—The desert grasses and shrubs on these ranges were in the best condition they have been for many years, following plentiful fall and winter precipitation. Water was available for all wildlife using the Kofa Range, but the supply on the Cabeza Prieta Range was not adequate. Numerous bighorn sheep were seen regularly on these ranges, but no accurate estimate of their numbers could be made. Gambel's quails were abundant, and coveys could be seen at the watering places at almost any time.

National Bison Range, Mont.—Of the 54 bighorn sheep on this range at the beginning of the year, 25 were transferred to the Hart Mountain Refuge, Oreg., which is believed to provide the species a more suitable habitat.

Desert Game Range, Nev.—About 350 bighorn sheep and 175 deer were estimated to be on this area at the end of the year. Conditions for the big game were excellent. Since the range was established 47 species of mammals and 66 of birds have been recorded.

Sheldon National Antelope Refuge, Nev.—Considerable rainfall during the spring months resulted in a good growth of browse for the

antelope and other animals, and at the close of the year there were on the refuge about 1,200 antelopes, including about 400 fawns, approximately 300 mule deer, 250 wild horses, and large numbers of sage hens.

Wichita Mountains Wildlife Refuge, Okla.—Spring rains on this refuge put the range in much better condition than in most years and brought up water levels in the lakes, which had been greatly lowered during the acute drought in the preceding summer and fall, when it was necessary to release water from Rush, Jed Johnson, and Elmer Thomas Lakes to supply Fort Sill and the city of Lawton. In January, 24 antelopes were received from New Mexico in exchange for the same number of elk. They appear to have acclimated themselves satisfactorily. With additional range made available by the curtailment of grazing by domestic stock, the longhorn cattle herd was permitted to increase slightly and numbered 171 at the end of the year, compared with 149 in 1939.

National Elk Refuge, Wyo.—Although no official enumeration of the elk in the Jackson Hole herd has been made since the spring of 1938, when 17,370 were counted, of which 7,782 were on the refuge, it was estimated that at least 9,000 spent the past winter on the area. Weather conditions were such that it was not necessary to feed them hay, and few losses occurred.

DEVELOPMENT OF REFUGES

Engineering Work

During the fiscal year, projects involving engineering work and inspection were undertaken on 72 refuges, the actual construction being done by C. C. C. and W. P. A. labor. Preliminary surveys were made on 29 refuges, and construction plans were drawn up for 32. In addition, technical information of use in the administration of the Federal Aid to Wildlife Restoration Act was developed and the engineering feasibility of a number of proposed refuges was investigated.

As in previous years, one hydraulic engineer attended to the filing of water rights and the protection of water supplies and negotiated with various Federal and State agencies on matters involving the use of water on or affecting the wildlife refuges. He was one of three engineers who represented the United States on the Souris River water adjudication and conferred with Canadian representatives on the distribution of the water of this international stream, on which three of the Biological Survey refuges in North Dakota are situated.

Biological Development

Food and cover.—In the marsh and aquatic planting program, 200,000 pounds of seeds, tubers, and rootstocks were collected within the refuge system, to meet the needs for biological rehabilitation of newly acquired areas and to hasten natural recovery on lands mismanaged by former owners. Improved seed-collecting technique and abundant crops combined in some instances to provide supplies somewhat in excess of immediate needs and permitted the distribution of material to other public agencies for use in wildlife-habitat improvement.

In the development of upland-game habitat, 1,250,000 trees, shrubs, and vines were used, part of which were made available through the cooperation of the Soil Conservation Service, Tennessee Valley Authority, Forest Service, and State conservation departments. About 3,000 pounds of tree and shrub seeds were collected for the propagation of wildlife food and cover plants needed for future development work, some of which were turned over to other agencies for propagation under growing agreements. For improvement of big-game ranges where intense utilization had reduced the forage supply, 12,000 pounds of seed, collected mostly within the refuge system, were used. To establish supplementary feed patches, 14,000 pounds of seeds of legumes and other food plants were sown on quail and turkey management sites.

About 30,000 acres of land were cultivated by sharecroppers, under agreements, and by refuge personnel to provide supplementary food for wildlife during critical periods and to aid in sustaining increasing wildlife populations. A large percentage of this acreage was sown to forage crops for geese. On a 5-acre field of millet and buckwheat planted on the Tamarac Refuge, Minn., 33 pheasants, 6 prairie chickens, 12 ducks, 1 Canada goose, and 11 white-tailed deer were seen feeding at one time.

Controlled burning.—The recognized importance of controlled burning in marsh management for waterfowl has led to an increased use of fire on coastal areas where field investigations indicate that this practice will be of greatest value. The importance of controlled burning in certain types of marsh vegetation is indicated by the fact that more than 100,000 blue and lesser snow geese fed extensively on burned areas on the Sabine Refuge, La., which they had previously avoided. Extensive field observations were carried on to obtain additional data on the several interrelated factors involved. Controlled burning was also practiced on several hundred acres of land lying within upland-game management demonstration units.

Control of noxious aquatics.—Factors favoring the development of an optimum waterfowl habitat also permit the growth of noxious plants that tend to supplant those of high value to wildlife and thereby minimize the utility of the area. Where the problem exists, control measures have been undertaken with noteworthy success, particularly in the reduction of cattails. Special equipment is being developed for future work of this nature.

Cover management.—The rapid response to habitat-improvement work on refuges is reflected in increasing wildlife populations, which in several instances have permitted the removal of mature breeding stock for restocking public lands. From the Sand Lake Refuge, S. Dak., 1,830 pheasants were distributed to 6 counties for restocking under the direction of conservation officials of that State. Surplus deer and raccoons also were released to various State conservation departments for restocking depleted coverts.

Nesting.—The design of boxes for tree-nesting ducks was improved on the basis of field investigations of their use. Artificial nesting boxes have produced a material increase in breeding wood ducks and goldeneyes, and 750 new ones were constructed and installed, and many old ones reconditioned. To provide essential habitat features for waterfowl and shorebirds in new impoundments, 49 additional nesting islands were constructed.

Winter feeding.—During severe winter weather, when it becomes necessary to provide grain for birds unable to find food because of ice and snow, not only is feeding done on the refuges but elsewhere in cooperation with local agencies. Some of the grain used is raised on the refuges, some is purchased, and some is donated by other agencies—Federal, State, or private. Through the cooperation of the Bureau of Agricultural Economics, 10,896 bushels of mixed grains were obtained from 12 grain-inspection stations.

The severe winter of 1939–40 made it necessary to do more feeding than usual. On and adjacent to the Brigantine Refuge, N. J., about 2 tons of grain were distributed daily to some 600 black ducks and other birds, much of it, quickly and effectively, by means of an airplane. Considerable feeding also was done on the White River Refuge, Ark.

Civilian Conservation Corps Development on Refuges

Work accomplishments.—The C. C. C. continued to have an important part in the long-range program of developing waterfowl and other game refuges. There were C. C. C. camps on 41 National and 1 State wildlife refuge in 26 States. The number of full-strength camps averaged approximately 35, and 1 side camp was used. Among

8 new camps, the one at the Ogden Bay State Refuge, Utah, is especially noteworthy because it is the first C. C. C. activity by the aid of which a State will directly participate under the provisions of the Federal Aid to Wildlife Restoration Act. Work programs were completed by 5 camps, making 20 in all that have finished the development work assigned to them by the Survey. Enrollees detailed by other services worked on 8 other refuges, making a total of 16 refuges improved by C. C. C. enrollees working from side camps or on special details.

The development work differed in each locality because of wide variances in soil and water conditions and their influences upon food and cover vegetation but was of the same nature as outlined in previous reports. The following few accomplishments indicate its scope: More than 240 miles of truck and patrol trails, 26 bridges, 70 miles of telephone lines, 80,908 rods of fences, 11 lookout towers, 18 dwellings, 6 overnight cabins, and more than 50 barns, garages, and other service buildings were constructed to enable the personnel to administer the refuges and maintain the sanctuary status effectively and economically. To provide favorable water conditions for wildlife, the enrollees built 8 large diversion dams; moved more than 1,700,000 cubic yards of earth in constructing dikes and levees; excavated more than 660,000 cubic yards of earth and rock to provide 21,570 lineal feet of ditches and canals; built 14 small reservoirs and 96 permanent check dams; cleared and cleaned debris and undesirable growths from approximately 560,000 square yards of water channels and 1,180 acres of lake and pond sites; and built 83 spillways and other water-control structures. They planted desirable food and cover vegetation on 4,696 acres.

Job-training and educational programs.—In the development work on the refuges thousands of enrollees are given practical training and instruction both in classroom and field, the training being practical rather than theoretical, because classroom work is supplemental to field training, which in turn is supplemental to actual field work, where more than 1,100 trucks, tractors, trail builders, graders, draglines, and other pieces of equipment were used by enrollees under skilled supervision. Of the 610,000 enrollee training hours, about 300,000 were given to instruction in truck, tractor, and dragline operation and repair; welding; surveying; the handling of dynamite; and the construction of roads, bridges, and buildings.

Safety program.—The safety program is closely correlated with the training program and is so emphasized that the accident-frequency record for 1940 was better than ever. The 1.35 accidents per 10,000 man-days of work in 1939 dropped to 1.13; that is, there were 1,054,920

man-days of labor with only 119 lost-time accidents, a decrease of 24 accidents from last year. At the close of the year, 8 camps had operated without a lost-time accident for 12 months or more, 1 of these, the Tule Lake camp, California, for 29 consecutive months. Three fatalities marred an otherwise satisfactory record.

Cooperation With the Work Projects Administration

The development of refuges by the W. P. A. was continued on 45 areas in 16 States, for which Federal W. P. A. allotments of \$831,298 were made available to the Biological Survey and provided approximately 13,675 man-months of employment. In addition, 23 Bureau-sponsored State projects were approved, for which Federal W. P. A. funds of \$865,676 were supplemented by \$298,490 from the Bureau for the purchase of materials and supplies and for furnishing equipment and supervision.

The emergency relief funds received from the W. P. A. not only enabled the Biological Survey to continue important development phases of its national wildlife-restoration program but also provided useful work for persons in need of relief. The great variety of work done included the construction of dams, dikes, and ditches for impounding water and creating marshes and the installation of structures for controlling water levels for the production of wildlife food and cover. Aquatic and upland vegetation, shrubs, and trees were planted to provide supplementary food and cover, reduce soil erosion, and assist in the prevention of floods. Nesting islands and upland-game shelters of various types were built, fences erected, refuge boundaries posted and marked, and roads and fire lines constructed or rebuilt. In several cases administration buildings were constructed and landscaped.

Federal W. P. A. funds totaling \$119,030, supplemented by Bureau contributions of \$32,136, provided 1,488 man-months of employment of statistical and clerical help to assist in bringing old work to date.

Inspection of proposed drainage projects.—In furtherance of a co-operative understanding, 202 applications submitted to the W. P. A. for drainage projects (most of which were State- or county-wide in character) were referred to the Bureau for review as to their probable effect on wildlife. Of these projects, 89 (538 units) were concerned with agricultural drainage for flood control and land utilization, and 113 (415 units) involved pest and malaria-mosquito control.

Of the 953 work units involved, 38 that threatened to be unnecessarily detrimental to wildlife were disapproved as recommended by the Bureau, 203 were recommended for partial or conditional ap-

proval, with the proviso that the plans be so modified as not to menace wildlife; and the remaining 712, which did not involve wildlife values, were recommended for unconditional approval. In the projects concerned with land-utilization drainage, practices were recommended and carried out that assured stabilized water levels and the least possible damage to wildlife; and in the mosquito-control drainage projects, wherever practicable, methods of mosquito reduction through impoundment and water control rather than mechanical drainage were recommended and effected. In this manner, appreciable acreages of wildlife habitat were saved from destruction.

National Youth Administration Assistance

The Biological Survey was fortunate in again having N. Y. A. labor available for research projects and other refuge work not suitable for C. C. C. and W. P. A. labor. It was utilized on most of the 68 North Dakota easement refuges; on the Moosehorn Refuge, Maine; Seney Refuge, Mich.; Tamarac Refuge, Minn.; Arrowwood and Des Lacs Refuges, N. Dak.; and Sand Lake and Waubay Refuges, S. Dak. The projects thus accomplished included constructing small boats, trailers, picnic tables and benches, office equipment, and snow fences; repairing and improving roads and fences; planting and cultivating lawns and tree and shrub plots; collecting and planting aquatic seeds; brush burning; patrolling; constructing banding traps, shelters, and nesting boxes; and making nesting studies and wildlife enumerations.

PUBLIC USE OF REFUGES

Economic Uses

In disposing of surplus products on some of the national wildlife refuges, there were issued 167 permits for cutting approximately 10,276 tons of various kinds of hay and 183 grazing permits covering approximately 107,093 animal months' use by 17,755 cattle, 12,659 sheep, 288 horses, and 75 hogs. Care was taken to safeguard the interests of wildlife. Before impounding water in timbered areas on some of the refuges it is first necessary to cut trees and brush from areas to be flooded. To 294 permittees, living mostly in the immediate vicinity of the refuges, who needed the wood for fuel, 6,500 cords of such surplus timber were given. To provide supplementary food for wildlife, 319 farmers cooperated with the Bureau in planting 27,829 acres of refuge land to grain crops on a share-crop basis.

Permission was granted to 286 permittees for such miscellaneous uses of refuge lands as harvesting hay; keeping bees; picking fruit; operating and maintaining stock driveways across refuge lands for

watering cattle; erecting, maintaining, and using buildings; and constructing power and telephone lines, roads, and ditches.

In the course of the regular effort to prevent increase of the herds to a point where they will overgraze the range, 184 buffaloes and 54 elk, 4 mule deer, 1 white-tailed deer, and 8 longhorn cattle were removed. These were either sold or donated for butchering or for exhibition and propagation.

The total revenue received for the use of refuge lands and from the sale of surplus big-game animals and other refuge products was \$75,845.28. In accordance with the law, 25 percent of this was turned over to the counties in which the refuges are situated and the remainder deposited in the Federal Treasury.

Recreational Facilities

In addition to the many people taking advantage of opportunities afforded on the wildlife refuges for recreation, such as picnicking, swimming, boating, fishing, and hunting (on 7 refuges only), thousands annually visit the areas to learn more about the conservation work being done. As many as 400 persons visited the Waubay Refuge, S. Dak., on Sundays during the summer, and more than 6,000 picnicked on or otherwise used the recreational area on the Moosehorn Refuge, Maine, during July. Each winter thousands of people visit the National Elk Refuge, Wyo., to see the elk concentrated on their feeding grounds.

Fishing is permitted on specified parts of many of the refuges when it is determined that it will not interfere with the wildlife. Eight orders designating fishing areas were issued during the year. More than 500 persons fished on the Squaw Creek Refuge, Mo., on the opening day of the season, and during 4 months 9,034 fishermen on the Chautauqua Refuge, Ill., took 116,471 fishes.

ADMINISTRATION OF WILDLIFE CONSERVATION LAWS

The principal Federal statutes administered by the Biological Survey for the conservation and restoration of wildlife are (1) the Lacey Act of 1900, as amended, regulating shipments in interstate and foreign commerce of wild animals, their dead bodies, or parts thereof, and the importation of live birds and mammals from foreign countries; (2) the Migratory Bird Treaty Act of 1918, protecting birds that migrate between the United States and Canada, as amended to extend its provisions to the treaty of 1937 protecting birds that migrate between the United States and Mexico, and regulating the movement of game mammals and parts thereof between the two countries; (3) the Migratory Bird Conservation Act of 1929, authorizing the establishment of

bird refuges; (4) the Migratory Bird Hunting Stamp Act of 1934, as amended, to aid in refuge establishment; (5) the Federal Aid to Wildlife Restoration Act of 1937; (6) a law (sec. 84, Criminal Code) protecting wildlife and Government property on Federal refuges; (7) through the Alaska Game Commission, the Alaska Game Law of 1925, as amended; and (8) the Bald Eagle Act, approved June 8, 1940, extending Federal protection to the bald eagle in the United States or any place subject to its jurisdiction, except in Alaska.

REGULATORY ACTION

The Migratory Bird Treaty Act regulations were amended in a very few particulars, the length of open seasons on waterfowl, coot, and Wilson's snipe being retained at 45 days, but opening in the intermediate zone on October 22 instead of October 15 as in 1938, and the possession limit on woodcock being changed from 4 birds to not more than 2 days' bag limit. Publications relating to conservation laws included a processed abstract of State fur laws affecting trapping seasons, possession, and the sale and shipment of pelts (Leaflet BS-147) and Wildlife Circular 2, the annual directory of game-protection officials. Amendments to the regulations under the Alaska game law were published in Alaska Game Commission Circular AGC-18. Conferences with representatives of State game departments on conditions affecting the conservation and hunting of migratory game birds were a great aid in drafting the hunting regulations for the 1940 season.²

WORK OF GAME-MANAGEMENT AGENTS

The 46 game-management agents and 19 deputy agents, singly or in cooperation with State officers and deputy game wardens, obtained evidence in 2,939 cases of game-law violations. Prosecuted in State and Federal courts, these resulted in 2,773 convictions as given in table 8 (p. 279).

Because of the hazardous nature of the duties of the game-management agents the Civil Service Commission on June 17, 1940, assigned them to the 62-year-age retirement group. To further game protection, the agents conducted film and radio programs, addressed schools, civic organizations, and sportsmen's clubs, issued statements through the press, and assisted locally on other lines of Bureau investigations. Results of their enforcement activities are exemplified in the following migratory game bird cases:

² Regulations for 1940, adopted by the Secretary of the Interior on August 2, were approved and proclaimed by the President on August 9 (5 F. R. 2813)

In Tennessee, a defendant was fined \$500 and \$50 costs for shooting mourning doves in a baited field.

In Louisiana, one alleged duck bootlegger was given a 75-day and another a 65-day jail sentence.

In Arkansas, for hunting ducks in close season, two defendants were each sentenced to 30 days in jail and fined \$150.

In North Carolina, a defendant was given a 4-month jail sentence for selling wild geese; another, charged with killing wild geese during close season, was given 60 days.

In Michigan, killing and possessing whistling swans brought a sentence of 30 days in jail and a fine of \$400.

In Nevada, two violators were each fined \$250 for killing ducks from a motorboat.

In Ohio, conviction on a charge of trapping ducks brought a fine of \$300 and \$23 costs, and a 3-month suspended jail sentence.

In Virginia, for selling wild ducks, a duck bootlegger was fined \$500.

Under-cover Operations

Out of current appropriations for the protection of migratory birds, the Secretary is authorized to expend at his discretion not to exceed \$10,000 for obtaining information concerning violations of Federal game laws. The expenditure of \$3,850.54 of this authorization in under-cover operations produced evidence obtained by game-management agents against many unlawful commercial dealers in game who otherwise might not have been apprehended. In addition to successfully conducted under-cover investigations in Louisiana, Maryland, Minnesota, Texas, Virginia, and Wisconsin, the results in the following States were outstanding:

In Tennessee, Arkansas, and Mississippi, 110 sellers or buyers of migratory waterfowl and other game birds were given an aggregate sentence of \$4,573 in fines and 216 days in jail.

In the San Francisco-Sacramento area, California, excellent cooperation by United States attorneys and Federal judges resulted in the conviction of 48 dealers in wild fowl, 3 of whom were fined \$500 each, 3, \$250 each, and the rest were given smaller fines and jail sentences ranging from 30 days to 9 months, the fines aggregating \$3,315 and the jail sentences 57 months.

Of 9 persons apprehended for dealing in migratory wild fowl in southern California, 4 were placed on probation for 1 year each.

In Iowa, duck bootlegging cost one violator a fine of \$250 and \$37.50 costs, and another \$125 and \$36.25 costs.

Apprehensions Under Various Statutes

Migratory Bird Treaty Act cases.—Of 829 new cases filed in Federal courts and 273 pending from the preceding year, 833 were disposed of with 666 convictions (table 7)—a decrease from the preceding year of 32 new cases and of 19 cases terminated but an increase of 18 convictions. Fines, ranging from 1 cent to \$500 and costs, aggregated \$19,656.64, fines totaling \$1,060 having been suspended in 22 cases. Jail sentences aggregated 3,321 days in 42 cases; suspended sentences, 891 days in 9 cases; and probation terms, 2,281 months in 84 cases.

TABLE 7.—Cases of Violation of the Migratory Bird Treaty Act Disposed of During the Year and Cases Still Pending on June 30, 1940

Disposed of	Num- ber	Pending	Num- ber
Convictions.....	666	From preceding year.....	273
Dismissals.....	48	New cases.....	829
Nol-prossed.....	42		
Jury trial, not guilty.....	18	Total.....	1,102
Closed without prosecution.....	18	Disposed of.....	833
No bill.....	38		
Closed by death.....	2	Pending at end of year.....	269
Dropped with leave to reinstate.....	1		
Total.....	833		

Migratory Bird Conservation Act cases.—Of 27 new cases and 16 pending from the preceding year, 38 were closed as follows: Thirty-four brought convictions, 3 were nol-prossed, and 1 was adjudged not guilty. The 34 sentences imposed aggregated \$1,160 in fines, 475 days in jail, and 6 months' jail sentence suspended, and 7 years and 1 day probation.

Migratory Bird Hunting Stamp Act cases.—Of 63 new cases and 30 pending from the preceding year, 70 were disposed of as follows: Four were closed without prosecution, 4 were dismissed, 1 was nol-prossed, 3 were found not guilty; fines aggregating \$481 and \$37.10 costs were assessed in 37, and 1 fine of \$25 was suspended; defendants in 2 cases were each sentenced to 15 days in jail and in 6 were each given 1 year's probation; and in 12 cases the accused were found guilty but were assessed penalties by the court upon counts charging violations of the Migratory Bird Treaty Act regulations.

Wildlife Refuge Trespass Act cases.—Of 8 new cases and 5 cases pending from the preceding year, 11 were closed, 1 being nol-prossed and 10 receiving convictions, an aggregate of 110 jail days being imposed in 7 cases; fines of \$105 in 2; and a year's probation in 1.

Upper Mississippi River Refuge cases.—Of 27 new cases and 20 pending from the preceding year, 24 were terminated, as follows: Convictions were obtained in 22, the fines aggregating \$125, suspended jail sentences 4 years and 10 months, and probations 26 years; 1 was nol-prossed; and 1 was closed without prosecution.

Lacey Act cases.—The 10 new cases and 2 cases pending from the preceding year were terminated, by convictions in 10, with fines aggregating \$220, by dismissal in 1, and by failure of the grand jury to return a true bill in 1. Agents making inspections under this statute in fur-receiving centers discovered information relating to possible infractions of State game or fur laws. Invoices relating to 1,658 shipments of pelts were sent to game-protection officials in the various States, Alaska, and Canada and disclosed 241 law violations that were terminated in State courts by fines and costs aggregating \$5,633.83.

Other cooperation with States.—Evidence regarding 1,752 cases involving violations other than illegal shipments of skins of fur animals were handled in 42 States, where fines and costs aggregated \$57,515.87 and jail sentences (91), 5,369 days. Investigations by State wardens and game-management agents working together broke up many commercial groups operating unlawfully in fur and game. In some instances State and Federal officers operated patrol boats jointly.

TABLE 8.—Summary of Penalties Imposed for Game-Law Violations, Fiscal Year 1940

Act or law	Convictions (number)	Fines and costs	Jail sentences (days)
Migratory Bird Treaty Act.....	666	\$19,656.64	3,321
Migratory Bird Conservation Act.....	34	1,160.00	475
Migratory Bird Hunting Stamp Act.....	38	518.10	-----
Wildlife Refuge Trespass Act.....	10	105.00	110
Upper Mississippi River Wildlife and Fish Refuge Act.....	22	125.00	-----
Lacey Act.....	10	220.00	-----
State prosecutions resulting from Lacey Act investigations.....	241	5,633.83	-----
State laws, cooperative prosecutions.....	1,752	57,515.87	5,369
Total.....	2,773	84,934.44	9,275

IMPORTATION AND OTHER PERMITS ISSUED

REGULATIONS

Treasury regulations were amended at the request of the Department of the Interior to require a permit for the importation of any number of canaries. The former privilege of allowing five to be entered without permit was often abused, other species being entered under the guise of canaries when the customs inspectors were unable to identify the birds. The regulations were further amended to limit to three the number of parrots or birds of the parrot family that may be entered without permit, in order to conform this regulation in this respect to the regulations of the Public Health Service.

SPECIES EXCLUDED

A few attempts to import prohibited species, including crested mynas (*Aethiopsar cristatellus*) and skylarks (*Alauda arvensis*), were detected by inspectors and frustrated. Applications for permits to import as cage birds several species of migratory birds from Mexico, Cuba, and Central America continued to be received but were refused. Quite frequently, ignorantly or deliberately, attempts are made to import migratory birds, especially of the sparrow and bunting types, as canaries. One mongoose, brought by a passenger from Africa, arrived at the port of New York on February 19. Denied entry by Customs officers, it remained aboard the steamer until chloroformed on March 2.

SPECIES ENTERED UNDER PERMIT

The number of importation permits issued was 1,492, including 18 at Honolulu, Hawaii; and 272 importations were inspected.

Birds

Foreign birds imported into continental United States, a total of 252,153, compared with 252,628 last year, included 135,287 canaries, 125 parrots, 85,995 Mexican quails, 3,081 Hungarian partridges, 897 pheasants, and 26,768 miscellaneous birds. At Honolulu, 255 foreign birds were entered, compared with 492 last year.

After the outbreak of the European war in September, large shipments of canaries for the United States were routed via Holland and Belgium instead of direct from Germany. From then on only one shipment of Hungarian partridges (2,400) was imported from Europe, compared with several large shipments the previous year. About 681 Hungarian partridges raised by breeders were brought in from Canada.

The first shipment of bobwhites from Mexico (2,800) arrived as early as December 2, the next, however, not until January 13. Thereafter and until the end of the season on April 15, the birds came in steadily in large consignments. The total number imported was 85,995, compared with 87,457 last year, of which 2,250 were entered at Brownsville, 5,800 at Eagle Pass, and 77,945 at Laredo, Tex. Imported for stocking purposes, most of these birds were distributed in Texas, Indiana, Kentucky, and Mississippi, but small lots were sent to 18 other States and the District of Columbia.

Among the more interesting pheasants imported were 8 Siamese fire-back pheasants (*Diardigallus diardi*), from Singapore; 12 copper pheasants (*Syrmaticus soemmerringii*), from Japan; 1 argus pheasant (*Argusianus argus*), from the East Indies; and 1 Swinhoe pheasant (*Hierophasis swinhoii*) and 1 Elliot pheasant (*Calophasis ellioti*), in a shipment from Canada.

In addition to the requirement of an importation permit from this Department and in some cases State permits, the entry of birds of the parrot family continues to be subject to the regulations of the Public Health Service. Among the more interesting parrots imported were 4 Kuhl lorries (*Vini kuhlii*) and 2 Society Island lorries (*Vini peruviana*), from Papeete, Tahiti.

Other interesting importations were 2 Falkland robins (*Turdus falklandicus*), 2 Chilean lapwings (*Belonopterus chilensis chilensis*), 2 Chilean sparrow hawks (*Cerchneis sparveria cinnamomina*), 6 chingolos (*Brachyspiza capensis*), and 4 guans (*Ortalis* sp.), from Chile; 7 chungas (*Chunga burmeisteri*), from Argentina; 2 Pacific pigeons (*Globicera pacifica*), from the Fiji Islands; 1 European jay (*Garrulus glandarius*), in a shipment from Japan; 6 crocodile plovers (*Pluvianus aegyptius aegyptius*), from England; 7 lesser double-collared sunbirds (*Cinnyris chalybea*), 1 Malachite sunbird (*Nectar-*

inia famosa), 1 Livingstone's touraco (*Turacus livingstonii*), 2 Hadada ibises (*Hagedashia hagedash*), 1 crowned hawk eagle (*Stephanoaetus coronatus*), 1 northern lizard buzzard (*Kaupifalco monogrammicus*), and 1 yellow-casqued hornbill (*Ceratogymna elata*), from Africa.

Mammals

Importations of black bear cubs from Canada, mostly destined for roadside menageries, were fewer than usual. The total number was 92, compared with 137 last year. Rhesus monkeys, imported chiefly as experimental subjects for human diseases, totaled 10,146, compared with 12,536 last year. Among other interesting mammals were 2 giant pandas (*Aeluropoda melanoleuca*), from China, 1 in September for the St. Louis Zoo and 1 in November for Chicago's Brookfield Zoo. Other rare and interesting animals included 1 potto (*Perodicticus potto*) and 2 Gambian pouched rats (*Cricetomys gambianus*), from Liberia; 1 crab-eating seal (*Lobodon carcinophaga*), from Palmer Land, Antarctic Archipelago; 1 murine opossum (*Marmosa elegans*) and 1 Azara's fox (*Pseudalopex gymnocereus*), from Chile; 1 manatee (*Trichechus inunguis*), from Brazil; 3 Tasmanian devils (*Sarcophilus harrisii*), from Australia; and 2 Arctic foxes (*Alopex lagopus*), in a shipment from Belgium.

PERMITS UNDER THE MIGRATORY BIRD TREATY ACT

For Scientific Purposes

To take migratory birds or their eggs for scientific purposes, 447 permits (general or under specific limitation) were issued and 1,753 were outstanding at the close of the year. Permits of similar limitation to possess migratory birds or their eggs, lawfully acquired for scientific purposes, were issued to 56 persons, and 564 were outstanding at the close of the year. Others issued were 167 for possession of one or a few specimens found dead; 155 for banding migratory birds; and 43 for taking birds and mammals in Alaska.

For Propagation

Permits to take migratory waterfowl for propagation were issued to 30 persons, each permit limiting the species and the number of individuals of each and the time to be taken. To possess migratory waterfowl lawfully acquired for propagating purposes, 319 permits were issued. At the close of the year 3,788 propagating permits were outstanding. Failure of permittees to render the required annual reports or to surrender their permits upon discontinuing operations resulted in 331 permits being recalled, canceled, or revoked.

Reports submitted by permittees disclose that 3,820 wild geese and 74,708 wild ducks were raised in captivity. Of these, 71,674 were mallards, 958 black ducks, 925 wood ducks, and the remainder principally teals, pintails, ringnecks, wigeons, and redheads. Sales of propagated migratory waterfowl included 15,075 ducks and 350 geese for food and 17,411 ducks and 1,224 geese for propagation. From propagating stock, 8 swans, 192 mourning doves, and 11 band-tailed pigeons were produced. Of propagated birds, 15,667 ducks, 360 geese, and 66 mourning doves were liberated.

For Depredation Control

To enable permittees to protect crops, fishes, and other property from serious depredations by migratory birds, 506 permits were issued. Many complaints of depredations were investigated and suggestions and aid given for relief without the necessity of killing the birds.

COOPERATIVE CONTROL OF INJURIOUS ANIMALS

Cooperative work in predator and rodent control entailed an expenditure of \$687,203 from departmental funds, \$475,644 from cooperating States, \$1,085,540 from cooperating counties, livestock associations, and others, and about \$536,698 from emergency funds. In these operations 116,805 predatory animals were taken, consisting of 104,072 coyotes, 1,355 wolves, 10,556 bobcats and lynxes, 608 predatory bears, and 214 mountain lions. Through W. P. A. cooperation in Montana, Utah, Oregon, and Idaho, W. P. A. hunters working under direct Bureau supervision ably supplemented the regular predator-control work. To reduce infestations of prairie dogs, ground squirrels, pocket gophers, jack rabbits, field mice, and other injurious rodents, treatment of 12,174,125 acres was supervised. In addition, without direct supervision but under general instructions of the Bureau fieldmen, approximately 20,659,759 acres were treated for the control of field rodents and, in cooperative campaigns for the eradication of the common rat, 198,902 premises were treated. The Bureau's supply depot at Pocatello, Idaho, prepared and distributed to cooperators in all parts of the country 1,822,085 pounds of rodent bait materials, as well as equipment for use in predator and rodent control.

PREDATORY-ANIMAL CONTROL

In harmony with established policy, predatory-animal control projects for the protection of livestock, poultry, and game were conducted only in areas where there was pressing need. The coyote is the chief subject to control, as it is responsible for a greater total loss to live-

stock and poultry than all other predators combined, and has markedly increased in the last 10 years in most sections of the West and is becoming established locally in the East. In the southwestern mountains and forests it is apparently increasingly skillful as a killer of both game and livestock. In many States where the game departments are seeking to develop suitable game areas predators interfere seriously with the increase and, in some instances, the survival of desirable species.

To curtail the spread of rabies and other canine-borne diseases required coyote control in some areas. A serious outbreak of rabies among coyotes in Pima and Santa Cruz Counties, Ariz., during July 1939 spread to domestic dogs and as a result several people were bitten and 16 were given the Pasteur treatment. Predator control was inaugurated after a fall and winter outbreak of anthrax in livestock in Beaverhead County, Mont., where coyotes were found to be feeding on the diseased carcasses and carrying parts of them to other localities, thus spreading the disease.

Cases of Predation

Following are a few representative instances of the many cases of losses occasioned by predatory animals during the year:

Coyotes.—One operator in Skull Valley, Ariz., lost 250 goats during 2 fall months. On a ranch in Hudspeth County, Tex., 1 male coyote taken by a Bureau hunter had killed 100 Angora goats within a short period. During January, February, and March, 31 buck deer were killed by coyotes on a ranch in southern Texas. A rancher near Buffalo, Wyo., lost 75 turkeys to coyotes in 1 night. Close observation demonstrated that coyotes destroyed 40 sage grouse near a water reservoir in Johnson County, Wyo., an area particularly adaptable to grouse and on which the State Fish and Game Commission is attempting to establish them. One sheepman in western Salt Lake County, Utah, lost 250 lambs to coyotes in less than a month, and one in Grant County, N. Dak., lost 125 from his flock of 500 sheep during the year. That coyotes occasionally injure crops also is shown by recent requests for assistance from southern California where the animals were inflicting severe damage to watermelons and avocados.

Wolves.—Within 3 months 1 red wolf destroyed 200 lambs on a ranch in McCulloch County, Tex. Bureau observers in Alaska report wolves more abundant than for the past 20 years and their depredations especially heavy on mountain sheep, caribou, and moose in the Mount Hayes section. Wolf predation in three parishes of north-central Louisiana became so severe by 1939 that the local cattle-and-hog industry was practically forced out of existence.

Other predators.—Bobcats are defeating the introduction and propagation program for wild turkeys and deer on the Pearl River County and Leroy Percy State Game Refuges in Mississippi, according to reports from the Mississippi State Game and Fish Commission. On a ranch near Ellensburg, Wash., a mountain lion stampeded a flock of sheep in a brushy canyon, killing 3 outright and causing the death of 52 others in the stampede pile-up. On a ranch in Hudspeth County, Tex., a female mountain lion killed 50 sheep within a few weeks.

Peg-legged predators.—Studies of food habits reveal that peg-legged, or trap-crippled, predators are more devastating to livestock than are normal individuals. Apparently this is because they are less capable of catching wild fleet-footed quarry and therefore prey more heavily upon young livestock. One male coyote that had lost two toes in a trap killed 26 yearling lambs valued at \$8 each in Fisher County, Tex., within a period of 30 days. Poor trapping technique aggravates the problem of control, and the employment of expert trappers is in line with efficient, economical, and humane procedure.

Benefits of Predator Control

A sheep operator in the vicinity of Rock Springs, Wyo., reported that as a result of the Bureau's predator-control activities his livestock losses were reduced from 10 to 3 percent. At the request of the Arizona Woolgrowers' Association a hunter was assigned to each of the sheep driveways during July to trap out concentrations of coyotes before the annual trek to winter pasture began. As a result, no serious losses were reported along the trail, whereas losses previously ran as high as 15 percent.

Coyote-control operations in Presidio County, Tex., resulted in a 40-percent increase in the antelope herd on one range. In a suburban area near Portland, Oreg., where coyotes were causing serious losses to small flocks of sheep and poultry, after 5 coyotes were taken there were no more losses. A hunter took 8 old killer coyotes in Stutsman County, N. Dak., and thus ended further depredations where small stockmen were being forced out of business.

Depredations on cattle and sheep in Winn Parish, La., were curtailed when a Bureau hunter took a 92-pound wolf and 3 smaller ones. After a 4-year pursuit a Bureau hunter, in Laclede County, Mo., took a destructive wolf to which one stockman alone had lost \$800 worth of sheep, and whose depredations had been so severe generally that the county government and local stockmen had offered a bounty of \$140 for its capture.

RODENT CONTROL

Damage in the West by ground squirrels, prairie dogs, kangaroo rats, pocket gophers, and other field rodents continued to be severe on crops, range vegetation, and silvicultural plantings. Tree-girdling mice inflicted great damage to orchard trees and nursery stock in some sections, though this was curtailed markedly in eastern areas where control has been practiced during the past few years. Widespread and in many instances severe depredations by the common rat varied greatly, from the contamination and destruction of stored food supplies and crops to gnawing of insulation from electric wires and cables. The kangaroo rat has been a major factor in depleting range forage on many western grazing areas, and through its seed-gathering habits this rodent tends to reduce the natural reseeding of range lands. One observer in charge of a reseeding project in New Mexico stated that his men could gather more valuable grass seeds from kangaroo rat dens in a day than they could in a week from the mature grass on the range.

The extent of rodent damage has led States, counties, municipalities, farm organizations, and others to increase their financial support to cooperative programs. Rodent control was also conducted through the medium of C. C. C. camps in cooperation with various governmental agencies. A number of W. P. A. projects also were instituted under trained leadership for the control of rodents to protect crops, range lands, soil-conserving structures, and silvicultural plantings. In numerous campaigns throughout the country the Survey cooperated with States, counties, cities, civic organizations, and State and local health departments for the suppression of the common house rat. On areas that had been treated for the eradication of field rodents in previous years, control was maintained through policing to prevent reinfestation.

Rodents and Communicable Diseases

New cases of sylvatic plague carried by rodents were reported for the following animals: Prairie dogs, in Sweetwater County, Wyo.; ground squirrels, in Fremont County, Idaho; Spokane County, Wash.; Wallowa County, Oreg.; and Elko County, Nev.; golden-mantled ground squirrels, in Eldorado County, Calif.; and rabbits, in Lincoln County, Wash.

In the lower Rio Grande Valley, Tex., cases of typhus fever increased alarmingly, 120 having been reported from Hidalgo County and 100 from Cameron County. In Kleberg County, where two deaths were reported, the disease was so prevalent that entire fam-

ilies avoided theaters and other public gatherings. To reduce the infection, rat control was instituted in these areas.

A project was inaugurated in Pierce County, N. Dak., in cooperation with the State Health Department, to suppress an epizootic of rabies, where rats had become infected and were partly responsible for its spread. A study was begun, in cooperation with the Food and Drug Administration of the United States Department of Agriculture, to determine the influence of rats in spreading the organism responsible for food poisoning.

Instances of Rodent and Rabbit Damage

Rabbits.—In the Kearney district and adjacent areas in Nebraska an exceptionally dry summer and fall caused especially severe jack rabbit damage. On individual farms, losses of as much as 30 acres in fall wheat were sustained and whole fields of clover and alfalfa were literally dug out. Jack rabbits defeated a project for the stabilization of sand dunes in Bent County, Colo., by completely destroying plantings made to obtain a stand of sod. In a nursery at Yankton, S. Dak., cottontail rabbits caused \$3,000 damage by girdling 5,000 apple trees.

Pocket gophers.—In Star Valley, western Wyoming, pocket gophers consumed an 80-acre field of dry-land alfalfa, making plowing and reseedling necessary. The cost of establishing the original stand was \$5 an acre. In requesting pocket gopher control work, the vice president of the Valley Land Co., at Malaga, N. Mex., wrote that the company was annually threatened with disastrous washouts in the main canal, caused by pocket gophers undermining the bottom and sides, and that repairs after several such washouts had cost thousands of dollars.

Other rodents.—Rat damage in rural sections of Crawford County, Ill., was reported by officials to amount to \$25,000 during the year. In rural sections of the North Central States the damage from rat infestations reached an all-time high during the fall of 1939. One fruit grower in the vicinity of Dupont, Ind., reported that field mice girdled 600 fruit trees, the greater proportion of which died as a result. Many growers in the fruit sections of the North Central States lost 25 to 150 trees in individual orchards through the depredations of field mice. Girdling by porcupines destroyed more than half a planting of red spruce near Cabot, Vt.

Benefits of Rodent Control

Following are a few of the typical benefits derived from the control of economically injurious rodents.

Pocket gopher control conducted on Reclamation Service projects in El Paso County, Tex., during the past 5 years has reduced the water loss 70 percent. The previous extremely heavy water losses were occasioned by leakage and washing through pocket gopher tunnels, but during the past year there have been no major breaks in canals or laterals. The carrying capacity of range lands in Chavez and Eddy Counties, N. Mex., has been increased 50 percent following prairie dog control conducted a few years ago. Of the 37,999 premises treated in a cooperative control campaign in the North Central States during the fall, 47 percent were free from rats after the first baiting, thus resulting in material savings to stored feed.

WILDLIFE CONSERVATION IN ALASKA

CHANGES IN REGULATIONS

The 1940-41 regulations under the Alaska game law, published in Circular AGC-18, the first to be issued by the Secretary of the Interior since the transfer of this function from the Secretary of Agriculture, contained few changes of material importance. A closed season is provided on martens throughout the Territory and on all fur animals in fur district 1, embracing southeastern Alaska. Beavers may be taken in fur districts 2, 4, 5, and 6, and the limit is 10 to each trapper. Open-season dates on other fur animals were adjusted.

A uniform season throughout the Territory was fixed on caribou, with a limit of 3 for residents and 2 for nonresidents. Shooting these animals is prohibited in an area 1 mile wide on either side of Steese Highway between mileposts 69.8 and 116. Moose are given added protection in a closed area half a mile on either side of all public highways in the First and Third Judicial Divisions. The seasons on mountain goat and mountain sheep were each shortened 15 days. On grouse and ptarmigan they were advanced to August 20 and the limits reduced to 10 grouse and 15 ptarmigans and an aggregate limit of 15. Black bears are afforded protection in the Loring area, and all species on sanctuaries, including the Wrangell-Shoemaker area on Wrangell Island and the Haines area embracing the drainage of the Klahini River.

For the first time in its history the Alaska Game Commission held its annual meeting elsewhere than at Juneau, and much favorable comment resulted. It met at Anchorage late in February with a twofold purpose: To make it possible for residents of that area to appear before the Commission to express their views on the regulations and for all the wildlife agents to be present.

LAW ENFORCEMENT

The use of airplanes has added materially to the effectiveness of law enforcement in Alaska, and one 2-place cabin airplane was purchased for service out of Fairbanks and two 4-place machines were ordered for early delivery. Wildlife agents were assigned to Sitka and to Kodiak Island. Cases of unusual importance successfully terminated by the Alaska Game Commission included the prosecution of two fur dealers who were fined \$500 and \$750, respectively, in the United States District Court at Ketchikan for failure to keep proper records; the seizure of 150 extra-large illegal beaver skins, currently valued at about \$4,000; and the apprehension in the remote Mount Hayes district, by aid of an airplane, of one of the worst game offenders ever known to the Commission. In this case, the agents seized the meat of 21 game animals, including 11 mountain sheep, 1 lamb, 2 cow moose, and 7 caribous; discovered 34 ram horns under a tree, most of which represented fresh kills; and found that the violator had fed mountain sheep to his dogs. Pleading guilty, the violator was fined \$150 and sentenced to jail for 5 months.

For the 246 violations reported, 32 of which involved aliens, fines aggregated \$6,985 and jail sentences, 3,148 days. The 381 furs seized included pelts of 202 beavers, 61 minks, 22 martens, 17 red foxes, 6 cross foxes, 11 blue foxes, 4 white foxes, 16 lynxes, 28 weasels, 8 otters, 3 wolverines, 1 wolf, and 2 coyotes. Deer, moose, mountain sheep, and caribou meat seized weighed 2,167 pounds. Other seizures included 1 brown and 1 grizzly bear, 178 traps, 26 resident hunting licenses, 58 firearms, and 1 duck stamp. The estimated value of the confiscated furs and traps was \$7,105.50.

WILDLIFE RESTOCKING PROJECTS

Some 800 pheasant eggs, obtained through the cooperation of the Washington State Game Department, were hatched at the Territorial experimental station at Petersburg, in the vicinity of which also several broods of pheasants were hatched in the wild. In the Wrangell Reserve area, 150 Mongolian pheasants were liberated and 100 are to be shipped to the Kenai Lake area in July, the first pheasant-stocking projects in these districts. Most of the pheasants received from the Wisconsin State Conservation Department last year, consisting of eared (blue and brown), Cheer, Reeves, and Kaleege varieties, wintered fairly well and laid eggs.

On Kodiak Island, beavers, muskrats, and snowshoe hares have increased splendidly, and the restocking projects there are reported to be doing exceptionally well. The 8 elk placed on Afognak Island in 1927 have increased until now there is one herd of 100-odd animals

and smaller herds, possibly of 50 to 75 each. The 19 buffaloes transplanted from Montana to the Big Delta area near Fairbanks in 1928 have increased to nearly 200. Several bands have resulted from the 18 mountain goats transferred from the mainland near Juneau to Baranof Island near Sitka, one of which it is estimated consists of 75 animals, and there are possibly 200 animals in all. Musk oxen transplanted in the Nunivak Island Wildlife Refuge are reported to number more than 90.

PREDATOR CONTROL

One predatory-animal hunter took a count during the winter of the wolves and coyotes in the Mount Hayes area, where more have been taken than in previous years, and studied their effect on game animals. All claims for the Territorial \$20 bounty on both animals are required by law to be certified by agents of the Alaska Game Commission, a proviso that has resulted in a considerable saving in avoiding payment of fraudulent claims.

BIOLOGICAL INVESTIGATIONS

Field research included a study of spring calving of the Kenai moose, a range and wildlife survey of the Matanuska-Susitna Valley, an investigation of the buffaloes in the interior, and continuation of Kodiak bear-cattle investigation. A few brown bears, said to have been stock killers, were taken under permit. Few kills by the bears were reported, and with the situation apparently well in hand, further damage should be negligible. A visit was made to Mount McKinley National Park for cooperation with the National Park Service in a study of wolf-mountain sheep relationships.

The range and wildlife survey of Matanuska-Susitna Valley was begun as part of a cooperative soil and land-use survey, and the preliminary reconnaissance indicated that (1) the woodland valley range of the immediate colony unit is generally of low grazing capacity and may be improved by clearing and seeding to bluegrass, fescue, wheatgrass, Dutch clover, and other cultivated forage species; (2) the mountain ranges are suitable for grazing livestock, and the estimated capacity for a 4-month summer season is 21,000 cattle and 60,000 sheep; (3) the area has an abundant wildlife population; (4) the present take of moose, sheep, and mountain goats is not excessive and may be continued; and (5) fishing furnishes the chief means of livelihood for 1,332 residents about Cook Inlet.

ALASKAN BIG GAME

The Alaska Game Commission estimates that more than a million big-game animals range over the Territory's wilderness areas. About 42,000 Sitka black-tailed deer are to be found in the humid southeastern

part of Alaska. Moose are particularly abundant on the Kenai Peninsula and in Rainy Pass. The caribou is still the most abundant big-game animal in Alaska, even though its numbers have been reduced. Once this animal moved across the Alaskan tundras in spectacular massed migrations that included herds of thousands of animals in areas where now there are only hundreds. In an effort to halt further decline, stricter regulations have been adopted and closed areas have been established along the highways, where these animals may be free to cross without being subjected to hailstorms of lead from passing motorists. Mountain sheep and mountain goats are maintaining their numbers and doing well. The various bears are more than holding their own—the grizzlies show little if any fluctuation; black bears are plentiful; the big brown bears show definite signs of increasing numbers; and in the far north the great white polar bears are more numerous than for a decade. Big-game hunters shipped out 217 trophies during the year, nonresident and alien hunters accounting for 134 animals and resident exporters for 83. Included were 39 moose, 35 mountain sheep, 8 mountain goats, 20 caribou, 11 deer, 73 large brown and grizzly bears, and 31 black bears.



CONSERVING AQUATIC RESOURCES.

Upper: Fur-seal harems on St. Paul Island, Alaska, one of the areas where the conservation work of the Bureau of Fisheries protects the supply of an important natural resource.

Lower: Stocking an improved mountain stream with rainbow trout forms an interesting angle of Bureau of Fisheries activities for the conservation of natural resources in the seas, rivers, and lakes of the Nation.

BUREAU OF FISHERIES

Charles E. Jackson, *Acting Commissioner*

ORIGINALLY established on Feb. 9, 1871, as the United States Commission of Fish and Fisheries, an independent agency, and redesignated the Bureau of Fisheries on July 1, 1903, when it was by law included in the newly created Department of Commerce and Labor, this Bureau has completed 69 years of active service in the field of fishery conservation.¹

During the past year encouraging progress was made in the development of practical programs of fishery management and in securing State and private cooperation in support of these programs. Biological investigations contributed much fundamental information that will assist in maintaining the productivity of the fisheries. Technological investigations contributed substantially to the development of better methods for the preservation of fishery products and to the more complete utilization of byproducts. Statistical studies provided a measure of abundance for most of the commercial and game species, thus furnishing a basis for regulation and assisting in the orderly production and distribution of fisheries commodities.

During periods of world disaster, such as wars and famines, the problem of supplying wholesome and nutritious foods in sufficient quantities is of paramount importance to the Nation—not only as it affects the armed forces, but the country as a whole. Such a condition prevailed during the last World War and is likely to again occur should similar conditions arise.

Under authority of the Secretary and the absolute control of the Bureau of Fisheries, the Alaska salmon in 1917 provided the fisheries resource from which the pack was increased over that of 1916 by about 25 percent, or 2,520,128 cases. This increased production on short notice is indicative of the ability of the Bureau to so regulate these fisheries as to constantly maintain a reserve upon which to draw.

¹ This, the Sixty-ninth Annual Report of the Bureau of Fisheries, is the first submitted to the Secretary of the Interior and the last to be made as the Bureau of Fisheries. In accordance with the President's Reorganization Plan No. II, this Bureau was transferred from the Department of Commerce to the Department of the Interior on July 1, 1939; and by Reorganization Plan No. III it was merged with the Bureau of Biological Survey on June 30, 1940, to form the Fish and Wildlife Service.

The Bureau has remained cognizant of the real and potential value of this vast food resource which has been intrusted to its keeping and, although continually providing the markets of the world with a canned fishery product of unquestioned excellence, it has constantly maintained a balance sufficient that should the need arise, production can again be stepped up to the required level.

In carrying on the work of the Bureau it has been necessary to maintain a number of vessels which, although designed primarily for specialized fishery activities, could readily be converted for use by the Navy in times of national emergency. The Bureau fleet could be augmented by hundreds of fishing craft and thus form a defense unit that would contribute materially to the conduct of naval operations.

SUMMARY

Data on the 1938 catch of fishery products were collected in all sections of the United States and Alaska except the Mississippi River area. The combined catch in the areas surveyed shows a decline of 2 percent in volume and 7 percent in value as compared with the catch in the same sections during the preceding year. Decreased catches were made in each of the geographical sections except the Chesapeake Bay and South Atlantic and Gulf States. Marked declines in the value of the catch occurred in the New England, South Atlantic and Gulf, and Pacific Coast States, and in Alaska. The value of the pack of canned fishery products in all sections declined 21 percent as compared with 1937; byproducts decreased 17 percent; cured fish about 5 percent; and packaged fish, 2 percent.

The total catch of fishery products in the United States and Alaska, as based on the most recent surveys, amounted to 4,253,445,000 pounds, valued at \$93,547,000. Slightly more than 130,000 fishermen were employed in making this catch.

The production of canned fishery products in the United States and Alaska during 1938 amounted to 667,527,840 pounds, valued at \$83,445,889; the output of byproducts was valued at \$30,576,367; the production of frozen fishery products, excluding packaged products, amounted to 117,125,519 pounds, valued at \$7,800,000; and fresh and frozen packaged fish and shellfish, 216,661,255 pounds, valued at \$27,243,645. Based on surveys for 1938 in all sections except the Mississippi River area, and for 1931 in that area, the production of cured fishery products amounted to 102,617,256 pounds, valued at \$14,865,530. It is estimated that about 680,000,000 pounds of fresh fishery products (excluding packaged fish and shellfish) valued at about \$50,000,000 were marketed during 1938. The total marketed

value to domestic primary handlers of all fishery products in 1938 is estimated at \$214,000,000.

INTERNATIONAL RELATIONS

HALIBUT INVESTIGATIONS

Under authority of the treaty of January 29, 1937, the International Fisheries Commission continued the regulation of the Pacific halibut fishery and carried on the scientific investigations of the halibut and its fishery, which form the basis for regulation.

The representation of the United States on the Commission was changed during the year. Mr. Frank T. Bell, who had been a member of the Commission since July 31, 1933, resigned effective January 31, 1940. Mr. Charles E. Jackson, Acting Commissioner of the United States Bureau of Fisheries, was appointed to succeed him. The membership of the Commission at the end of the year was: Mr. L. W. Patmore and Mr. A. J. Whitmore, for Canada; Mr. Charles E. Jackson and Mr. Edward W. Allen, for the United States.

Meetings of the Commission were held at Seattle on July 7 and December 12, 13 and 14. At the latter meetings, Mr. L. W. Patmore was elected Chairman and Mr. Edward W. Allen was elected Secretary for the ensuing biennium.

In fulfillment of its regulatory duties, the Commission determined the catch limits necessary for each regulatory area, recorded the catch from each area, forecast and announced the date of attainment of each area limit and closed the areas accordingly. In 1939, areas 1 and 2, which include all halibut-fishing grounds south of Cape Spencer, Alaska, were closed to halibut fishing at midnight July 29. The total catches were 1,068,000 and 24,309,000 pounds, respectively, for the two areas. Of the area 2 catch, 373,000 pounds were taken under permits while fishing for other species after the closure of that area. Areas 3 and 4, which include all the halibut-fishing grounds north and west of Cape Spencer, were closed at midnight October 28 with catches of 25,360,000 pounds and zero pounds respectively.

The 1940 fishing season was opened on April 1 under regulations issued on March 25, 1940. Several changes were made in these regulations to facilitate enforcement and to assure limitation of the catch to the prescribed poundage which is as much as is justified by the present condition of the stock. Possession of undersized halibut was prohibited, fishing was restricted to one area on any one trip, and provision was made for the examination of all records dealing with the landing, purchase, and sale of halibut. At the request of the fleet, the method of closure of area 3 was changed to conform to that of area 2.

Investigations necessary for the fulfillment of the purposes of the treaty were continued by the scientific staff of the Commission. These included the collection and analysis of current statistical and biological data which serve as a measure of the changes occurring in the stocks of halibut as a result of regulation and which are a necessary basis for the continued rational control of the fishery. The biological investigations made necessary the operation of two vessels.

Tagging operations were carried on from a chartered halibut vessel during the winter spawning season in area 2. A total of 1,303 halibut were marked in northern British Columbia and southeastern Alaska. From the recovery of these marked fish it is anticipated that valuable information will be obtained concerning the relationship of the spawning populations to the other stocks within area 2 and regarding the rate at which these spawning populations are being removed by the fishery. Materials for the study of age, growth, sex, and state of maturity were also collected during the operations.

Measurements of halibut landed by the fleet were continued to determine the changes occurring in the size composition of the marketable fish as a result of regulation. Material for the age studies was collected at the same time. Preliminary analysis of the measurements of area 2 fish has failed for the second successive year to show any increase in the average size or in the proportion of larger, and therefore mature fish.

The abundance of halibut as shown by the catch per unit of gear fished did not show the improvement that has characterized the catch of the previous eight years. The abundance in area 2, between Cape Spencer in Alaska and Willapa Bay in Washington, was 12 percent lower in 1939 than in 1938, which brought it back to the 1937 level. No change in abundance from that of the previous year was indicated in area 3, where the stocks are in good condition. Although the abundance in area 2 is still 71 percent greater than in 1930, the last year of unrestricted fishing, the marked decrease in abundance in that area must be regarded with concern in view of the unsatisfactory condition of the spawning stocks there.

The effects of regulation upon the production of spawn in area 2 were again observed by means of net hauls taken at sea during the winter spawning season. Analysis of these observations shows that the decline in abundance of eggs from the peak of 1936-37 was continued for the third consecutive year. While some fluctuations may be expected, due to variations in spawning conditions and spawning stocks, the occurrence of such a continuous decline must be regarded as serious. In view of the decreased catch per skate and the un-

favorable trend in the size composition of the marketable sizes of fish in area 2, the decline in production of eggs indicates a decrease in the abundance of spawners in that region that may be expected to have a further unfavorable effect upon the fishery when the young produced by these spawnings enter the fishery 5 or 6 years later.

The most satisfactory explanation, at the present time, of the unfavorable trend in the area 2 stock must be the large amounts of halibut which are known to have been taken recently, both legally and illegally, in excess of the catch limit assigned to the area. It is apparent that a sharp reduction of these excess catches will be necessary to assure the maintenance of past improvements and to make possible further improvements in the condition of the stock.

The investigations of the Commission continued to measure the changes taking place in the stocks of halibut on the banks. They prove that the halibut fishery is still in a critical condition and that more effective enforcement of regulations is needed. They indicate that more intensive investigations than have been possible in recent years are necessary to guide the Commission's future actions.

THE INTERNATIONAL PACIFIC SALMON FISHERIES COMMISSION

The sockeye salmon season of 1939 was the second since proclamation of the Convention between Canada and the United States for rehabilitation of the Fraser River fishery for that species, one of the greatest of modern conservation projects.

The purpose of the Convention is to rebuild the great runs of sockeye to the Fraser River system of British Columbia. The "big" run of every fourth year until 1913 would be worth \$30,000,000 at present prices, but the largest of recent years has been worth about \$4,500,000. To restore these runs, the International Pacific Salmon Fisheries Commission was created, consisting of three members from Canada and three from the United States, in 1939, as follows: A. L. Hager, Chairman, Vancouver, British Columbia; E. W. Allen, Seattle, Wash.; C. E. Jackson, Washington, D. C.; A. J. Whitmore, Ottawa, Ontario; Tom Redi, New Westminster, British Columbia; and B. M. Brennan, Secretary, Seattle, Wash.

The Commission has selected Dr. W. F. Thompson as Director of Investigations.

It is provided in the understandings attached to the Convention that "The Commission shall not promulgate or enforce regulations until the scientific investigations provided for in the Convention have been made, covering 2 cycles of sockeye salmon runs, or 8 years." The first concern of the Commission during these first years has therefore been the scientific investigations, but the study of natural and artificial

obstructions and the use of methods of assisting propagation have received attention.

As required by the understandings attached to the treaty, the Commission has chosen an Advisory Committee from the industry. It has also chosen a scientific council with which the Director of Investigations and staff can consult.

During 1939, the Commission met in Vancouver on July 2, 3, and 4. The midwinter meetings were held in December 1938 in Ottawa and January 1940 in Washington, D. C. The Advisory Committee met with the Commission during the July meetings. The Scientific Council met with the Director in August.

At these meetings the Commission discussed and approved the program necessary. It agreed upon the funds required, since the money appropriated by the respective Governments would decide whether this program could be carried out. Furthermore, since the expenses of the Commission are joint in character, to be discharged in equal shares by the two Governments, the smaller of the two appropriations made must be the limiting one, and it was agreed that a special effort must be made to secure the needed amount from both.

The needs of the Commission are evident from the nature of its duties. Once established, the main features of the research program must be continued from year to year until the necessary information is obtained over at least one cycle. The sockeye of the Fraser River tends to return as a 4-year-old, so that the runs occur in cycles of 4 years. The runs of each year of the four are assumed by current scientific opinion to be more or less independent, very likely composed of different "races" occupying each a home stream to which it returns. Within a 4-year cycle each such race would therefore recur and any program to determine these races, their characteristics and home streams, must cover at least 4 years. Furthermore, the initial investigations must, of course, be exploratory and preliminary, as they have been in 1938 and 1939, and it must be expected that the funds required will increase as the program matures.

During the meetings in 1939, the Commission discussed and approved the extensions of the program it considered vital for the purposes of the Convention. With the "thorough investigation into natural history" already well under way, it was considered that the remaining duties of the Commission, as stated by the Convention, should receive attention by certain extensions of its program. These extensions are those specifically called for by the Convention. They cover the adoption of methods of assisting propagation and the study of obstructions, natural or artificial, in order that recommendations might be made regarding them. The Commission unanimously de-

cided upon, and has requested of the two Governments, the additional funds necessary to inaugurate the required engineering and biological studies. Until such are received, important phases of the duties outlined by the Convention must remain in abeyance, a fact which the formal action of the Commission emphasizes.

The investigations of the Commission were reviewed at the mid-winter meeting in Washington, D. C. With special emphasis upon facts necessary for regulation, they covered the migrations of the races of adult sockeye, their abundance, rate of movement, and time of passage through salt and fresh water to their spawning grounds. The effect of obstructions upon migration, the extent and nature of the spawning grounds, and factors influencing the success and failure of spawning were surveyed.

As in 1938, sockeye were tagged at Sooke, at various places in Puget Sound and the Gulf of Georgia, and at Hell's Gate in the Fraser River canyon, for study of the migration and habits. The returns were extraordinarily high. At Sooke 1,051 fish were tagged, and 51 percent returned, as compared to 44 percent in 1938. As before, those tagged prior to the first week in July were returned from rivers other than the Fraser. Of other tagging in salt water, 6,152 fish were tagged, and 65 percent recaptured, as compared to 2,587 tagged and 47 percent recaptured in 1938. At Hell's Gate 4,344 fish were tagged and 54 percent returned, as compared to 2,128 and 27 percent in 1938. The operations were continued over the full season, instead of about half as in 1938. Analysis of the returns is underway.

At Hell's Gate the time of passage and degree of obstruction to movement were studied. The run past that point was found to be divisible into sections, each bound for a different part of the Fraser River; exceedingly valuable information for regulatory purposes.

Observers were again stationed at the canneries for sampling of the catch, recovery of tags, and gathering of statistics. Others were stationed in the several sections of the Fraser watershed to estimate and take samples of the escapement, recover tags, survey the grounds, and report on obstructions. As before, there was the closest cooperation with the officers of the Canadian Department of Fisheries.

It was obvious that despite the utmost vigilance, enumeration of the escapement by existing methods was neither accurate nor complete. Accordingly the successful experiment on a relatively simple method tried at Cultus Lake and described in last year's report was this year extended to the Harrison-Birkenhead system, tributary to the Fraser. Traps and weirs were constructed and the runs there studied closely as a preliminary to a more extensive experiment in 1940, if funds become available. It is now clear that here, as in the main river, there

is a definite sequence of runs bound for different sections, and that a large proportion of the sockeye which passed were not subsequently observed in the estimation of the spawning population.

During the year a biometric study was made of the races within the Fraser and in other rivers to which sockeye caught with Fraser River fish are bound. A great mass of data was collected and has now been analyzed in part.

The experiments at Cultus Lake with methods of estimating escape-ment were carried further. At the same time the experiments on the control of predators and the factors influencing the survival of young, as well as their natural history, originated by the Fisheries Research Board of Canada, were continued.

The collection of statistics and materials for a general history of the Fraser River and its sockeye runs was continued on an extensive scale.

COOPERATION WITH FEDERAL, STATE, AND OTHER AGENCIES

The Division of Fish Culture is vitally concerned in placing its product—fish and eggs—in environments where the greatest dividends will be derived from stocking. Because the Bureau's staff of biologists has been entirely inadequate to conduct surveys of all the inland waters of the United States, fish applications from individuals and clubs are submitted to more than 20 State fish and game commissions for approval before stocking the specified waters with the species requested. In some States the authorities stipulate the species, number, and size that will give best results, while in others the stocking programs have been formulated and the combined output of the State and Federal hatcheries has been budgeted to conform to these programs. The exchange of eggs and fish, especially trout (*Salmonidae*) and related species, has been of mutual benefit in a number of States.

In view of the tremendous amount of angling in the waters within the national forests, there has been close cooperation between the Forest Service of the Department of Agriculture and the Bureau in an effort to maintain good fishing in those areas. More than 20,449,000 fish were assigned to the Forest Service for the stocking of suitable waters during the past year. Trout-rearing units were operated in the Chattahoochee, Natahala, Pisgah, Allegheny, Huron, Marquette, Chequamegon, and Superior National Forests, and approximately 1½ million trout were reared to large fingerling, or legal size before liberation.

The Bureau continued to cooperate with the National Park Service in the restocking of waters under its control. It appears that an all-time record will be established with regard to the number of black-

spotted trout eggs collected from waters in Yellowstone Park this season.

In the Tennessee Valley area, 3-way agreements between the Bureau of Fisheries, the Tennessee Valley Authority, and the States of Alabama, Tennessee, and North Carolina have been made effective. The Tennessee Valley Authority has completed a pondfish hatchery having a water acreage of 111 acres on the Elk River in Alabama. The personnel assigned to that hatchery is now collecting brood stock and treating the pond bottoms to reduce the loss of water through seepage. The hatchery operated at Norris, Tenn., was enlarged during the year. The State conservation departments will distribute the fish produced at these units for the stocking of waters in that part of the Tennessee Valley area within their respective State boundaries.

The New Jersey Board of Fish and Game Commissioners donated the services of its staff for the surveying of potential Federal pondfish hatchery sites in New Jersey. Further assistance was received from various State agencies in setting up W. P. A. projects to cover extensive construction programs at Federal hatcheries.

The Bureau of Reclamation has continued its efforts to preserve the runs of salmon in the Columbia and Sacramento Rivers, where the survival of this species is threatened by huge dam-construction projects. In connection with this work, one of the four salmon hatcheries originally contemplated has been partially completed and placed in limited operation.

CONSTRUCTION ACTIVITIES

The major part of fish-hatchery construction during the year was in continuation of projects previously started. The 1940 appropriation carried funds for the establishment of hatcheries in Illinois and New Jersey, a substation in Maine, and/or the enlargement of the East Orland (Maine) Hatchery. Difficulty in selecting a site, and absence of State enabling legislation, prevented any action in Illinois. In New Jersey it was not possible to obtain a suitable site at a price low enough to permit adequate development.

A site near Salem, Maine, was selected for a small trout-rearing and bass-cultural unit, and the title was cleared late in the year. Construction of this unit was not started prior to June 30. At the East Orland station, buildings and ponds were rehabilitated and provision was made for resumption of the propagation of Atlantic salmon.

All of the appropriations for the above projects were continued available and none of the projects were abandoned.

At the start of the year previously approved hatchery projects at Hebron, Ohio; New London, Minn.; and Farlington, Kans., en-

tered a more active phase of construction. At the two former, appropriated funds were supplemented by W. P. A. allotments, with a large work camp assigned to New London. Construction of the Kansas project was retarded by adverse weather conditions, and none of the establishments were developed to the point where fish-cultural work could be undertaken at the close of the year.

Toward the end of the 1939 fiscal year, allotments of P. W. A. funds were made available which provided \$30,000 for the construction of a bass hatchery at Carbon Hill, Ala., and \$60,000 for the development of fish-cultural facilities in Yellowstone Park. Of the latter sum, \$20,000 was reallocated for the construction of the Glacier National Park hatchery at Creston, Mont. With the exception of the Yellowstone Park project, these jobs were nearing completion at the end of the year. The construction of the Glacier Park hatchery was taken over by the Bureau when the project was in an incomplete status. This work was initiated by the National Park Service, and upon the exhaustion of funds available to that agency it was necessary for the Bureau to assume the responsibility for completion.

W. P. A. allotments totaling \$188,047 were allocated to 20 fish-cultural stations for repairs, improvements, and further developmental work. Among the projects undertaken was the construction of four rearing ponds at Moorefield, W. Va., to serve as an auxiliary to the Leetown (W. Va.) Station. This allotment supplemented the regular construction appropriations. Seventeen projects of a similar nature, which had been financed by W. P. A. allotments during the previous year, were continued in operation until these funds were expended. In addition, several W. P. A. projects were approved under State quotas covering similar work. The flexibility permitted under the procedure of transferring W. P. A. funds to the Bureau has been of great value in meeting unforeseen contingencies at the numerous field stations.

JAPANESE ACTIVITIES IN BERING SEA

As was the case during a number of previous seasons, the Japanese training ship *Hakuyo Maru*, of the Tokio Fisheries Institute, made a cruise in North Pacific waters. She visited St. Paul Island on July 11 and 12, thus giving the students a chance to become familiar with fur-seal operations at the Pribilof Islands.

Crab-fishing operations were conducted again in the season of 1939 by the Japanese vessel *Toten Maru*, accompanied by 3 self-navigating tenders and carrying 10 launches. The chief place of operation was in the open sea between 55° and 57° north latitude and between 163°30'

and 168° west longitude. These operations were discontinued by the middle of May and did not interfere with the salmon fishery in that region.

ALASKA FISHERIES SERVICE

ADMINISTRATION OF FISHERY LAWS AND REGULATIONS

Operations in the Alaska fishery industry were observed closely in all areas by field agents of the Bureau, and regulations with respect to commercial fishing were modified during the progress of the season, as circumstances warranted, to permit the fullest possible utilization of the fishery resources consistent with conservation requirements. The Acting Commissioner of Fisheries spent several weeks in the Territory studying problems of fishery management. Following the close of the fishing season he initiated the policy of holding annual hearings in the various fishing centers in order to obtain the views of those engaged in the industry with regard to regulatory measures.

Revised regulations for the protection of the commercial fisheries of Alaska were issued by the Secretary of the Interior on January 4, to be effective in the 1940 season. The new regulations were based upon the evidence presented at the Alaska hearings and in supplemental briefs, as well as upon data gathered by the Bureau's patrol force and biological investigators. Commercial salmon fishing in the Bristol Bay area was restricted to approximately 50 percent of normal operations for the purpose of rebuilding the weak cyclical run of red salmon which occurs in this area in the years divisible by five. The weekly closed period was increased to 60 hours in the Prince William Sound area and in most sections of southeastern Alaska, in order to provide a more continuous escapement of pink salmon throughout the season. In the southeastern Alaska area commercial fishing for herring was prohibited except by gill nets or for bait purposes, and in the Prince William Sound and Kodiak areas herring-catch quotas were established to prevent depletion. Other changes in the regulations included slight modifications of seasons, limitations upon the size of nets, and restrictions upon waters open to commercial fishing. One feature was the closure of 20 salmon fish-trap sites previously open to this type of apparatus.

Separate regulations were issued on May 28, 1940, with regard to the protection of game fish and other fish in the fresh waters of Alaska, as distinct from the regulations pertaining to the commercial fisheries. The publication of separate sport-fishing regulations was found advisable in view of the rapid development of sport fishing in the Territory in recent years. The new regulations define game fish and

establish limitations on the time, means, methods, and extent of sport fishing in the fresh waters of Alaska.

A congressional investigation of the Alaska fisheries was begun during the summer of 1939 by a subcommittee of 7 members of the Committee on Merchant Marine and Fisheries. The subcommittee was assisted by a joint committee of 4 members from the Territorial legislature. This investigation was concerned primarily with the use of traps in catching salmon, the advisability of maintaining or changing the prescribed fishing seasons, the effect of herring fishing operations upon the salmon fishery, offshore fishing by foreign nationals for crabs and salmon, and other matters concerning the conservation of the fisheries of Alaska and a reasonable development of the fishing industry.

The congressional committee held public hearings at nine important fishing centers in Alaska and one hearing in Seattle, Wash., in the course of the investigation. At each hearing supplemental statements and briefs were invited, and these, together with much additional information of a factual nature, were made a part of the record of the hearings. A report of the investigation, together with recommendations of the committee, was published as Report No. 2379 under date of June 5, 1940.

Dr. Carl L. Hubbs, of the University of Michigan, was engaged to make a special investigation of the fisheries of Alaska on behalf of the Secretary of the Interior in the season of 1939. Dr. Hubbs covered the Territory widely, including a visit to the Pribilof Islands, and upon his return in the fall submitted an exhaustive report.

Under the authority granted by the act of August 2, 1937, for the protection of oyster culture in Alaska, a 6-year lease was executed for 100 acres of bottoms in Alaska. This is the third such lease to be executed under the act. An output of 52 gallons, or 455 pounds of oysters was produced in the Ketchikan district in 1939. This is the first reported commercial production of oysters in Alaska waters, although there has been some experimental cultivation since 1931.

A patrol of the fishing grounds was maintained by 14 Bureau vessels, 1 chartered vessel, 5 speedboats of the Bureau, and numerous small craft. As in previous years, chartered airplane service was used to some extent to supplement the vessel patrol, and also for surveys of spawning grounds and transportation of officials to isolated districts. One hundred and seventy-eight persons were identified with fishery law-enforcement work, including stream guards, weir operators, crews of patrol vessels, wardens, and biologists.

In a few isolated regions, funds provided by the Territorial legislature and by local fishery operators were used to continue the payment

of bounties on predatory trout that feed upon salmon eggs and fry. This work is administered by the Bureau in connection with the regular patrol of fishing grounds. Studies of the Dolly Varden trout were continued in the Kodiak area, and considerable numbers of these predators were destroyed by employees in charge of salmon-counting weirs.

PRODUCTS OF THE FISHERIES

The total production of the Alaska fishery industry in 1939 was somewhat less than in the previous year, notwithstanding an increase in the number of plants and persons employed in the industry. The total output was 368,536,000 pounds, valued at \$40,104,000, as compared with 446,664,000 pounds, valued at \$42,870,000, in 1938. The estimated value of the 1939 catch to the fishermen was about \$11,321,000, or approximately \$719,000 less than in the preceding year. There were 30,572 persons employed in the various branches of the industry, as against 28,084 in 1938.

Salmon products represented 73 percent in volume and 91 percent in value of the total fisheries output in Alaska in 1939. Ninety-three percent of the salmon products consisted of canned salmon, the pack amounting to 5,263,000 cases, or 252,631,000 pounds, valued at \$34,441,082. Red salmon comprised 37 percent and pinks 48 percent of the total pack of canned salmon, as against 37 percent and 47 percent, respectively, in 1938. As compared with the pack in the preceding year, the output of canned salmon in 1939 showed a decrease of about 23 percent in quantity and about 6 percent in value. One hundred and nine canneries were operated in Alaska in 1939, or 11 more than in the previous year, and the number of persons employed in the salmon-canning industry increased from 22,280 in 1938 to 24,921 in 1939.

There were 21 herring plants operated in 1939, as compared with 17 in the previous year. Products of the herring fishery were valued at \$2,090,000, an increase of about 2 percent over 1938. Halibut landings were slightly less in 1939 than in the previous year, and many of the minor fishery products, including clams, shrimp, and crabs, also were less than in 1938.

ALASKA FUR-SEAL SERVICE

General Activities

Sealing and foxing operations were carried on as usual by the native inhabitants of the Pribilof Islands under the supervision of the Bureau's staff. Approximately 80 additional natives from the mainland and Aleutian Islands were employed during the summer to assist with fur-seal activities, and 25 employees of the Fouke Fur Co. also

were detailed to the islands for several months to assist in the curing and packing of the skins.

The byproducts plant on St. Paul Island was in operation again, rendering oil and meal from seal carcasses and blubber. The total production for the season amounted to 32,809 gallons of oil and 502,914 pounds of seal meal. Small quantities of these products were retained at the islands to be used for fox food, but most of the oil and meal was shipped to Seattle for disposition. About 75 tons of seal meal was delivered to the Division of Fish Culture for use in Federal fish hatcheries, and the surplus meal and oil were sold through competitive bidding for the account of the Government.

Four new frame houses were built for natives on St. Paul Island, and a new machine shop was almost completed. Other improvements included an addition to the boatways, the erection of a small pump-house, and the building of a reindeer corral. On St. George Island a new bunkhouse for natives was completed.

Annual supplies for the Pribilof Islands were transported from Seattle aboard the U. S. S. *Capella*, through the cooperation of the Navy Department. The Coast Guard also rendered valuable cooperative service in patrolling waters of the North Pacific and Bering Sea for the protection of fur seals and sea otters, and in giving other assistance in the Bureau's work.

The entire season's take of sealskins was shipped to St. Louis, Mo., to be processed and sold at public auction by the Fouke Fur Co. for the account of the Government, under the terms of the contract of June 9, 1939. In accordance with the terms of the fur-seal treaty of 1911, Japan will receive a 15-percent share in the proceeds of sale, and Canada will receive a like share. The Government of Canada discontinued the previous arrangement for taking delivery of the skins in kind.

The United States received a shipment of 210 Robben Island fur-seal skins, or 10 percent of the number taken by Japan in 1939. This represents the annual share due this country under the terms of the fur-seal treaty. The Department's selling agents at St. Louis, Mo., received the skins for processing and sale.

Seal Herd

The total number of animals in the Pribilof Islands fur-seal herd as of August 10, 1939, was 2,020,774. This is an increase of 148,336 over the computed number in the preceding year.

Take of Sealskins

In the calendar year 1939 a total of 60,473 fur-seal skins were taken on the Pribilof Islands, or 2,109 more than in the preceding

year. Of the total number 47,646 were taken on St. Paul Island and 12,827 on St. George Island. Insofar as possible the killings were confined to 3-year-old males, and a sufficient reserve of this age-class was left for breeding stock.

Sale of Sealskins

In the fiscal year 1940 two public auction sales of fur-seal skins were held at St. Louis. At the sale on October 2, 1939, a total of 21,764 Pribilof Islands sealskins sold for a gross sum of \$463,338.25. The sale included 8,030 skins dyed black, 8,516 dyed Safari brown, 5,100 dyed Matara brown, and 118 raw and partly processed skins. Matara brown is a recently developed color which was offered at this sale for the first time and proved very popular. On April 1, 1940, a total of 28,749 Pribilof Islands sealskins sold for a gross sum of \$585.687. This sale included 9,599 skins dyed black, 9,595 dyed Matara brown, and 9,555 dyed Safari brown. In addition, 210 sealskins from Japan and 2 confiscated skins brought \$3,150.75.

Sealskins disposed of at private sales, under special authorization by the Secretary of the Interior, consisted of 277 dyed black, 170 dyed Safari brown, 265 dyed Matara brown, and 32 raw-salted skins, which brought a total of \$17,224.89. In all, 51,469 fur-seal skins were sold for the account of the Government in the fiscal year 1940 for a total gross sum of \$1,069,400.89.

Foxes

The management of the blue-fox herds on the Pribilof Islands continued to be one of the important activities. During the winter of 1939-40 a total of 1,258 fox pelts were taken, including 377 blue and 8 white pelts from St. Paul Island, and 869 blue and 4 white pelts from St. George Island. Sufficient stocks were reserved for breeding purposes on both islands.

In the fiscal year 1939 there were sold at public auction 1,018 blue- and 11 white-fox skins taken on the Pribilof Islands in the 1938-39 season. The blue pelts brought \$17,001.50, and the white pelts brought \$143, a total of \$17,144.50.

Fur-seal Skins Taken by Natives

The privilege of taking fur seals at sea is granted to aborigines dwelling along the Pacific coast, under provisions of the North Pacific Sealing Convention of July 7, 1911, although such sealing is restricted to primitive methods. In 1939 Indians under the jurisdiction of the United States took 61 fur-seal skins, and Indians under the jurisdiction of Canada took 576 sealskins, all of which were duly authenticated by officials of the respective Governments.

Fur-seal Patrol

Ten vessels of the Coast Guard were instrumental in enforcing the laws and regulations for the protection of fur seals and sea otters in the North Pacific and Bering Sea. One vessel of the Bureau of Fisheries also was assigned to patrol waters off the coast of Washington during the period of sealing operations by the native Indians.

Protection of Sea Otters, Walruses, and Sea Lions

Regulations for the protection of walruses and sea lions were continued in effect without change. The capture of these animals is permitted only under certain limited conditions. Sea otter investigations were made at the Amchitka substation, and for the first time observations were continued throughout the year. The killing of sea otters is prohibited at all times.

PROPAGATION AND DISTRIBUTION OF FOOD AND GAME FISHES

While subsequent revision may alter the totals slightly, it is evident that the output of fish and eggs at the Federal hatcheries during the fiscal year 1940 approximated 7,400,000,000. In comparison with the 8,042,000,000 production of the previous year, there was a reduction of approximately 7.9 percent, or 640,000,000 fish and eggs. This drop is in part attributed to a curtailment in production of cod, haddock, and flounders. Activity with this group is governed by weather conditions, and the intensity of local commercial fishery operations. Both of these factors were adverse during the winter of 1939-40, with a consequent retarding of the hatchery functions.

The principal reason for the apparent slowing down of Federal fish-cultural work was the fact that the production of whitefish and pike-perch, hitherto shown as derived from the Put in Bay (Ohio) Station, was dropped from the records. This work was taken over by the Division of Conservation of the State of Ohio, preparatory to the formal transfer of the hatchery property to the State, as authorized by Congress. This station produced its usual quota of these two species but is listed as a State activity, and its output is omitted from the Federal records. This situation was, therefore, responsible for a reduction of 340,000,000 fish and eggs as reported by the Bureau of Fisheries, although the hatchery continued its service to the fishing industry.

As a matter of fact 24 different species were distributed in increased numbers, among them 6 species of trout and one variety of Pacific salmon. Increases were also registered for shad, striped bass, buffalofish, and lobster. There was a reduction of approximately 1,000,000 in the output of the black basses, which are also

subject to adverse weather conditions during the spawning season. Some 45 different species were handled at the various hatcheries.

Despite the reduction in the total output there was little change in the actual number of the fingerlings and larger sizes of game fish. It is gratifying to note that the production of game and pan species amounted to 151,723,000, an actual as well as proportional increase. These forms comprised 2.5 percent of the total output, but it must be recognized that practically all of the species propagated are sought for recreation at certain times or places.

As maintenance of a continuing stock of food fishes, particularly in coastal waters, contributes to a stable economy, and as maintenance of a well-grounded recreational asset in the form of angling contributes to a sound morale, the Department's fish-cultural functions have made their contribution to the basic elements of national defense.

PROPAGATION OF COMMERCIAL SPECIES

Stormy winter weather prevailing off the New England coast limited the activities of the smaller commercial fishing craft operating in the inshore waters. The spawntakers based at the hatcheries at Gloucester, Mass., and Boothbay Harbor, Maine, were therefore unable to obtain and fertilize the usual quantity of cod and haddock eggs. During the pollock season conditions were more favorable, resulting in an increased rate of salvage for this species. At Woods Hole, Mass., there was difficulty in obtaining an adequate supply of spawning flounders, resulting in approximately 50 percent reduction in the egg collections. Experiments in planting the flounder fry in Narragansett Bay and Long Island Sound were continued, though on a reduced basis.

At Boothbay Harbor, Maine, improved production of fourth-stage lobster fry was attained by heating the water supply for the hatchery. This practice was intensified in handling the lobster hatch during the summer of 1940, and was adopted at the rearing plant maintained by the State Department of Sea and Shore Fisheries.

The aggregate output of fish and eggs from these three stations exceeded six and one-half billion, of which over five and one-half billion comprised fertilized eggs recovered as a salvage measure.

Pacific salmon.—Exhaustive investigation by Bureau biologists, and the report of an independent board of consultants, has indicated that enlarged hatchery operations will constitute one of the most important elements in a plan for maintaining the run of salmon in the Columbia River. There is evidence that the same conclusion may be reached with reference to the Sacramento River in California. The mammoth hatchery developments under construction by the

Bureau of Reclamation in and near Leavenworth, Wash., were not in full operation at the close of the year. It was expected, however, that part of the 1940 run of salmon would be handled at this plant.

The existing salmon hatcheries located on the Rogue River, on Puget Sound, and at Quinault, Wash., as well as on the two rivers mentioned above, produced an aggregate output somewhat less than the previous year. The greatest reduction was with the chinook salmon, the difference being 13,000,000. Fewer chum salmon were propagated. There was a slight increase in the output of silver salmon, with the production of the valuable sockeye species practically unchanged. Nearly one-half million humpback salmon were provided, this being the year for the 2-year cyclic run of this species.

The salmon hatcheries also propagated steelhead trout and were successful in doubling the output of this much-sought game fish. The hatchery at Little White Salmon, Wash., has been in process of reconstruction during the year, and minor improvements, mainly new ponds, were developed at several other points. Hatcheries at Mill Creek and Battle Creek, Calif., were inundated during the floods which visited the Sacramento Valley, but damage to property was negligible and loss of fish was slight.

Anadromous species, Atlantic coast.—For the second successive year the production of shad was increased, totaling 42,000,000 in comparison with 34,000,000 during the previous year. The James and Chickahominy Rivers in Virginia were served by the pondfish station near Roxbury, Va., where previous attempts at shad culture had been largely unsuccessful. Experiments in the rearing of shad fry in ponds were continued, the results indicating that this practice may be a valuable supplement to present methods when suitable ponds are available. Yellow perch and white perch were also propagated at the shad stations on the Potomac River and Albemarle Sound. A production of almost 6,000,000 striped bass fry at the hatchery on the Roanoke River in North Carolina represents the highest level attained with this species in many years.

Of outstanding interest is the resumption of the propagation of Atlantic salmon in Maine. After working out preliminary plans in cooperation with the Maine Department of Inland Fish and Game, the facilities of the East Orland Hatchery were improved. A few thousand salmon eggs were obtained from the Dennys River run in the fall. These were hatched and are being reared to fingerling size before planting. During the spring approximately 100 migrating salmon were taken from the fish ladder at Bangor, Maine, and transferred to a holding pool prepared at the hatchery. Losses of injured fish were slight, and at the close of the year this relatively small stock of brood salmon was in good condition and prospects were favorable

for the collection of several hundred thousand eggs. While the work is of limited magnitude in comparison with the scope of the activity in earlier days, there is every reason to hope that the restoration of the Atlantic salmon is definitely under way.

Commercial species, interior waters.—With the transfer of the Put in Bay (Ohio) Hatchery activities to the control of the State of Ohio, the culture of Great Lakes species is markedly limited. A limited number of lake trout, whitefish, and lake herring eggs were obtained for the Cape Vincent, N. Y., and Duluth, Minn., stations. At the latter point most of the lake trout eggs were supplied by the State of Michigan. The State also supplied lake trout fry which were transferred to the Charlevoix (Mich.) Station, which has been reconditioned as a rearing unit. Losses were heavier than was anticipated, and the fingerlings were released before they had attained the desired growth. However, the effort was repeated during the spring of 1940, and at the close of the fiscal year approximately one-half million lake trout fingerlings were thriving and growing rapidly. It is believed that the planting of lake trout at a larger size will, to a large extent, compensate for smaller numerical output.

The production of pike-perch was only a small fraction of the output of previous years, the reduction being due to the transfer of the hatchery on Lake Erie which has produced the bulk of the eggs of this species. Aside from the Great Lakes species, the commercial fishes of interior waters comprise mainly the carp, buffalofish, and catfish. Since the supply of carp appears to be holding up well, no effort was made by the Bureau to propagate that species during 1940. In the case of buffalofish and catfish there was a significant increase in the plantings of eggs and fish. The buffalofish were planted almost entirely in the Upper Mississippi area.

Game species.—Inasmuch as the game and pan species of interior waters are subject to angling exploitation of increasing intensity, special attention was given to the culture of these species. All varieties of trout were distributed in larger numbers, and in many instances in larger sizes. It has been recognized that smaller local waters, farm ponds, and State and county parks, if well stocked with common panfish, present a recreational asset of great importance to a very large part of the population. Consequently the production of the sunfishes, catfishes, and lesser game fishes has been augmented for the purpose of maintaining a supply of fish in waters which may not be frequented by the more ardent angler. Most of the new hatchery developments have been planned with this object in mind. Certain advances and improvements have been effected in hatchery technique, but the actual stocking of the waters them-

selves remains the principal function in which effectiveness can be increased.

At the close of the year the Bureau assumed responsibility for a trout hatchery and rearing unit constructed by the Forest Service on Warm River, Idaho. The site is considered one of the best in the Western United States. A few Dolly Varden trout were propagated, although its low esteem by the anglers discourages any general attempt to increase its abundance. Efforts of several years duration to establish the smallmouth bass in the Southwest appear to have been crowned with success, although additional time will be required for the species to become abundant. The Bureau has continued to experience a shortage of Loch Leven trout, following the virtual elimination of the egg supply previously obtained from the Madison River in Montana. Substitution of a domesticated brown trout stock has been resorted to as a means of overcoming the deficiency. One of the railway distribution cars was retired from service during the year, since the fleet of distribution trucks has been built up to a point where transportation by highway largely supplants movement by rail.

A new demand for warm-water fish has developed as a result of the program of farm pond construction sponsored by the Soil Conservation Service. Although these requirements and the demands for stocking other waters under direct Federal control have been given priority, the percentage of unfilled applications from private individuals and organizations has remained at a low level.

Shipments of rainbow trout eggs were made to Puerto Rico, Hawaii, and to the Republic of Colombia. A successful hatching season during the winter and spring provided an excellent stock of young fish which were being held for rearing and subsequent distribution at most of the stations at the close of the year.

Upper Mississippi Wildlife and Fish Refuge.—The traditional salvage or rescue of stranded fishes in the overflow areas was virtually terminated. The Bureau's policy of constructing propagating ponds at suitable points within the refuge was fully justified by the production achieved at Genoa, Wis., Guttenberg, Iowa, and several other points. The yield of bass was so great during the summer of 1939 that distribution facilities were taxed to the limit. The 1940 hatch was not as heavy, but the production was of great value in maintaining the supply of fish in the great recreational areas in Minnesota and Wisconsin. In addition to this type of fish-cultural work, the headquarters station at LaCrosse, Wis., also provided a large quantity of trout for the same areas.

DIVISION OF FISHERY INDUSTRIES

The Division of Fishery Industries is concerned with the activities and welfare of the commercial fisheries and fishery industries. Its work includes the planning, supervising, and conducting of: (1) The Fishery Market News Service; (2) fishery statistical surveys; (3) investigations in fishery technology; and (4) investigations in fishery economics and marketing, including the administration of the Fishery Cooperative Marketing Act.

Studies and investigations are planned particularly to promote the more orderly marketing of fish and shellfish, to develop commercial uses for little-known or little-used fishery products, and new uses for the better-known species and commodities, and to improve the technology of capture, manufacture, handling, and marketing. This work tends toward the elimination of waste in marketing, and greater utilization of the fishery harvest. Consequently, it accomplishes an important function in conservation. This is imperative, since obviously haphazard and wasteful marketing and technological practices result in a greater drain on the resource for the same volume entering consumption. Thus, the types of activities conducted are of great value in maintaining the important food and industrial resource represented by fish and other aquatic forms, particularly in view of the possibility of a national emergency.

FISHERY MARKET NEWS SERVICE

Essentially, the fishery market news service constitutes the exchange of market information between the fishermen or producers in the fishing areas, and the middlemen in the terminal markets, with the Bureau of Fisheries acting as the exchange agency; that is, the agency for collecting and disseminating market information. The Market News Service now maintains six field offices from which daily reports are issued. These are located at New York, N. Y.; Boston, Mass.; Chicago, Ill.; Seattle, Wash.; Jacksonville, Fla.; and New Orleans, La. The locations of these field offices have been so carefully chosen that the current data collected and disseminated through them cover some phase of the marketing of about one-half of the 3,000,000,000 pounds of fish and shellfish taken annually for food in the United States and Alaska.

New York City was selected for the first Market News office, since it is the center of this country's most important consuming area and the market to which fishery commodities are shipped from all parts of this Nation and from foreign countries. This market exercises considerable influence over production and prices of fishery products throughout the country.

The choice of Boston for a Market News office was due to its importance as the center of New England's valuable fisheries and as a port of landing for large quantities of fish. Thus, Boston is primarily an office for the reporting of production.

Chicago is probably the most important inland market for fishery products. Much of the harvest of fresh-water fish from the Great Lakes and other interior waters is shipped to this city's wholesale market for distribution. Chicago also receives large quantities of Eastern haddock and rosefish, Western halibut and salmon, Gulf coast shrimp and red snapper, and large quantities of Canadian fresh-water varieties.

Seattle is of importance particularly as a landing port for the halibut fisheries of the Pacific Northwest. It also is of importance as a port of landing for salmon in the fresh and frozen fish trade and for other species common to the Pacific coast.

Jacksonville is of importance as an assembling, distribution, and shipping center through which most of Florida's fish pass when destined for northern markets. Consequently, market information emanating from this office is of greatest value to both northern and southern producers, shippers, and dealers.

New Orleans is the largest centrally located city in the Gulf States, which are important in the production and distribution of many fishery commodities; particularly shrimp. Consequently, this city offers unusual facilities for the collection and dissemination of valuable fishery market news data.

In addition to the coverage of market news in these producing, consuming, or distribution centers, the daily releases from each office are augmented by pertinent data telegraphed to it from the other offices, as well as from market news reporters located at important producing points along the coasts.

During the past year the Market News Service has completed arrangements for the daily broadcasting of market news information from radio stations at Boston, Chicago, Jacksonville, and New Orleans, and is making arrangements for similar broadcasts in other cities. Periodic market news reports also are prepared and disseminated from the Washington office. These include summarized data made available through the daily and monthly reports of the field offices as well as articles relating to the commercial fisheries and other related information.

STATISTICAL INVESTIGATIONS

The collection of fishery statistics was one of the earliest activities of the Bureau of Fisheries, and the supplying of these data has continued to be a major function. Fishery statistics are collected to serve

biological and economic purposes. Since the fisheries are usually prosecuted in areas not under private ownership, the problem of their conservation is of national concern. It therefore is important that the Federal Government keep close watch over the condition of the various fisheries in order that depletion may be anticipated in time that remedial measures can be successfully taken. Thus, current statistical data must be obtained on the yield of our fisheries. These figures furnish the biologist with the background from which he estimates future trends and yields. In addition to their value in the conduct of conservation studies, the Bureau's statistical surveys form the basis for information of greatest importance to guide the fishery trade in the conduct of its business activities.

Sectional surveys.—The basic statistical surveys are those for the various geographical sections. These cover complete statistics of the volume of the catch of fish and its value, employment in fishing, quantity of fishing gear used, number and classification of fishing and transporting craft, employment in wholesale and manufacturing establishments, and the volume and value of manufactured fishery products and byproducts. The first comprehensive survey of this type was made for the year 1880. Surveys following 1880 until recent years were periodic, or covered a limited number of States or areas in any single year. Currently, however, complete statistical surveys of the commercial fisheries in all marine and lake sections are being made. Detailed tabular statements based on the sectional surveys are published annually.

Landings at certain important United States ports.—In addition to the basic sectional surveys, the Bureau also conducts various local or special surveys. These include the daily collection of data on the landings of fishery commodities by fishing vessels at the ports of Boston and Gloucester, Mass.; Portland, Maine; and Seattle, Wash. Statistical data for the New England ports are recorded according to the fishing areas from which the catch is taken and gear used in capture. Consequently, this information is most important in following the trend of the yield of the important North Atlantic species. Data on daily landings at Seattle are of equal importance in following the trend of the fisheries for halibut and other North Pacific forms. Data on these landings of fishery products are published monthly.

Shad and alewife fisheries.—Shad once entered the streams of the Atlantic coast, on their spawning migration, in much greater numbers than they now do. Two of the most important streams of present spawning migrations are the Hudson and Potomac Rivers. Consequently, in order that detailed data may be available for the study of these fisheries, annual surveys are made of the production of shad

in these rivers. Annual surveys are also made of the catch of alewives in the Potomac River.

Canned fishery products and byproducts.—Since 1921 annual surveys have been made to collect statistics on the production of canned fishery products and byproducts of the United States and Alaska. These data are of importance to the industry as a guide in their manufacturing activities. This information is published annually.

Cold-storage holdings of fish.—Through the cooperation of the Agricultural Marketing Service, Department of Agriculture, statistics are collected and published monthly on the cold-storage holdings of fishery products and quantities frozen by important species or groups of species. These figures are shown separately for major geographical sections. Since holdings of fishery commodities in cold storage represent a considerable portion of the available supply of fishery commodities on hand at any one time, these data are eagerly sought by the fishery industry. Monthly cold-storage bulletins are published.

Sponge market, Tarpon Springs, Fla.—The domestic sponge fishery is confined to the State of Florida, and a large part of the production is sold through the Sponge Exchange at Tarpon Springs. In view of the importance of this exchange in the total domestic sales transactions of the industry, the Bureau obtains and publishes statistics of the quantity and value of sponges by variety classifications which are handled through the exchange each year.

TECHNOLOGICAL INVESTIGATIONS

The principal objective of fishery technological investigations is to increase the economic value of the aquatic harvest by more complete and efficient utilization. Toward this end studies are conducted of the technical phases of fish production, processing, and marketing. In planning these studies efforts are made to select those which have the broadest fundamental application. The value of technological investigations does not end with their application to the fishing industry, as other American industries also make extended use of the results of this work. For example, the Bureau pioneered in this country in the development of quick-freezing methods as adaptable to the preservation of fishery products. These methods now have widespread application in the preservation of fruits, vegetables, poultry, and meat. In another instance, a search for new sources of vitamins A and D was conducted and it was found that oils from many species of fish are rich in these vitamins. A direct outgrowth of these investigations is the production of oils having a high vitamin content from the livers and viscera of various species of fish such as halibut, tuna, and swordfish. This work has resulted not only in raising the income of the fish-

ery industries through the sale of products heretofore wasted, but it also has been most valuable to the drug industry. Of outstanding importance, however, is the contribution of this work to the health of our people by providing an economical and convenient source of vitamins A and D.

It should be pointed out that technological work, through studies which promote the greater utilization of domestic aquatic forms and through the development of new uses for these commodities, is making the people of the United States less dependent upon foreign sources, which is vitally important in view of present world conditions.

Specifically, the technological work of the Bureau during the past year has dealt with problems in the preservation of fishery products for food, in the manufacture of fishery byproducts, and in the nutritive value of aquatic products in general.

Preservation of fishery products for food.—Studies on the preservation of fishery products for food are conducted in the fields of chemistry, biology, and engineering. Their purpose is the improvement of the quality of fishery food products; the development of scientific tests for judging the quality of fishery products; the development of methods for further improving sanitary conditions in fish-packing plants; and the development of additional fresh, frozen, cured, and canned fish foods. During the past year there were many requests for research on problems of this type. This is indicative of the desire of the fishery industry to place on the market food products which will meet the most exacting requirements as to quality and wholesomeness, and to make the most effective use of the fishery harvest. Not only has the fishery industry been instrumental in having these studies conducted, but it has been quick to adapt to commercial practice many of the recommendations resulting from this work.

Manufacture of fishery byproducts.—Investigations in the manufacture of fishery byproducts have been particularly concentrated on the economic utilization of salmon cannery trimmings and fish livers and visceral organs; the preparation of fish meals of improved nutritive value; the problems of the storage of fish meal; oxidation of fat in fish meal; and the solubility of fish proteins.

Nutritive value of aquatic products.—Studies on the nutritive value of aquatic products have always occupied an important place in the fishery technological investigations because the food value of a product ready for marketing is, in most instances, the true yardstick or measure of the value of a new method of processing or an improvement in existing methods in the industry. For example, assuming that costs of processing are equal in each case, if a new method of manufacturing fish meal or a new method of freezing fish fillets pro-

duces a finished product of better quality, measured in terms of food value, then that is a true estimate of its worth or justification for its commercial application.

The problems undertaken in this field during the past year have been concentrated on determination of the nutritive value of the edible portion of fishery products, more particularly the biological value of the protein. Considerable effort has also been expended on evaluation of the feeding value of fish meals and a study of changes resulting from conditions of processing and storage.

Study was also made of the biological value of the protein of salmon taken under different physiological periods such as prior to migration, during migration, and, finally, spawning. Acute and chronic toxicity tests with certain kelp products, Irish moss, and agar, have also been carried out.

ECONOMIC AND MARKETING INVESTIGATIONS

There was a constant demand throughout the year for economic studies of the various phases of the commercial fisheries and the marketing of fishery commodities. The limited facilities of the Bureau make it possible to conduct only a very limited number of large-scale studies of these types. During the past year, however, a rather extensive survey of the retailing of fresh and frozen fish was made. Data thus far reviewed show that the volume of sales for fish was small for most of the stores surveyed. The sales of nearly 40 percent of the 4,000 retail stores handling fish, which were included in the survey, averaged less than \$100 per week during 1938. For about 30 percent of the stores, sales of fish averaged between \$10 and \$29 per week and less than 30 percent reported fish sales in excess of \$29 per week. The 4,000 stores handling fresh fish were located in both commercial and residential sections of about 50 representative cities in the eastern section of the United States. Included among these stores were nearly 1,200 chain stores, over 2,000 independent stores and voluntary chain stores, and about 400 fish markets. Preliminary results of the study indicate that very few stores have extensive facilities devoted to fish sales. Frequently fish are handled on only two or three days of each week, and on these days fish are allocated a small part of the space usually occupied by meats. A large percentage of the stores reported that the fish business is profitable, and some operators indicated that fish was the most profitable item handled. However, many owners and managers of stores evidenced little interest in fish sales and consequently devoted little effort to promote this phase of their business.

It is expected that a great deal of information valuable to retail fish dealers and allied interests will become available upon the completion of the tabulation and analysis of the large volume of data collected in the course of this survey.

Work in connection with the administration of the Fisheries Cooperative Marketing Act was continued during the year. Such work particularly took the form of collecting, analyzing, and disseminating information. This unit of the Bureau offers an advisory service to fishermen who are considering the desirability of forming cooperatives.

Other studies relating to the economics of the fisheries or the marketing of fishery commodities conducted during the year included investigations of the surplus-fish situation; a compilation of the magnitude of the commercial fisheries of the world; the assembling of data on the commercial fisheries as a source of employment; a study of the significance of byproducts to the fishery industries; a review of the rosefish fishery of New England; and studies of such specific fisheries or industries as the Chesapeake Bay soft-crab industry, the shark fishery of the South Atlantic coast, and the Pacific coast oyster industry.

BIOLOGICAL FISHERY INVESTIGATIONS

The primary purpose of all biological fishery investigations is to insure a continuing supply of fish and shellfish for food and industrial purposes. The measurement of the drain on existing resources, the determination of withdrawals that may be made without endangering future supplies, and the development of devices or procedures to protect undersized fish from wasteful and destructive methods of fishing are of fundamental importance from the standpoint of conserving an important food resource. In time of war or threatened war increased exploitation of the fisheries is inevitable. The progress of fishery biology since the first World War will prevent a repetition of many of the serious mistakes made during that period, when certain fishery resources were reduced to dangerous levels by uncontrolled exploitation. It is essential, however, that the programs of investigation that are now in progress, and that are providing information essential to proper fishery management, should be continued without interruption through any period of national emergency if our aquatic resources are to be safeguarded.

North Atlantic fishery investigations.—Biological fishery investigations in North Atlantic waters are concerned primarily with determining the size of available stocks of fish, measuring fluctuations

in abundance of these stocks from year to year, and discovering how large a catch may be made each year without impairing the future productiveness of the stock. For approximately 10 years such a study has been under way for the haddock, which supplies a larger yield than any other New England food fish. It has been demonstrated that in the Georges Bank area, which accounts for the major part of the catch, fluctuations in the abundance of commercial-sized haddock follow regular cycles, which are related to similar cycles in the number of young that survive to commercial size. When years of intensive exploitation of the stock happen to coincide with years of poor survival of the young, a sharp decline in haddock abundance may be expected. Extensive data collected and analyzed by the staff have provided an index of the size of the haddock stocks on Georges Bank for the period from 1914 to 1937. Because of changes in the size and composition of the fleet and the adoption of new gear which in itself increased the effectiveness of fishing operations by at least 29 percent, the catch records alone are no indication of the abundance of haddock, but must be subjected to elaborate statistical analysis before the size of the available stocks may be ascertained.

Mackerel landings on the Atlantic coast in 1939 were considerably smaller than in 1938, although the early months of the 1940 season were marked by a slight upward trend. There has been, moreover, a steady decline in the number of purse-seine vessels engaged in mackerel fishing, with the 1940 fleet the smallest in many years. Investigation of the mackerel fishery has brought to light many significant facts related to the distribution, spawning habits, growth rate, and migrations of the species. While progress has also been made toward determining measures of abundance and predicting changes in the availability and abundance of the mackerel, final solution of these problems awaits offshore investigations from the newly acquired fishery research vessel *Albatross III*.

The various species of groundfish, including the haddock, cod, pollock, rosefish, cusk, hake, and several species of flounders, form the basis of the most important New England fisheries. Fluctuations in the total yield of these fishes have been noticed in past years, but until a biological study of groundfish was begun in 1938 the causes and extent of these fluctuations were unknown. Indices of abundance are now being constructed for each species. When these indices are completed and the requisite knowledge of the life history becomes available for each species, it will be possible to suggest means of maintaining the population at that level which will yield the largest sustained annual catch.

The lobster is of paramount importance to the shore fisheries of the North Atlantic States, since it furnishes a large part of the income of great numbers of small-boat fishermen from Maine to New Jersey. The decline of the lobster catch to approximately one-third of its former level, in spite of vast increases in the amount of gear fished, led to a cooperative investigation by the Bureau of Fisheries and the State of Maine. The primary purposes of this study are to develop improved methods of lobster rearing and to determine the proper legal-size limit. Measurement of lobsters caught commercially along the Maine coast indicates that only about eight percent of the lobster population has an opportunity to spawn, suggesting that present size limits result in both an economic and biological waste. Further research on this problem is in progress.

The past year witnessed increased interest in the restoration of Atlantic salmon. In cooperation with representatives of Maine and other North Atlantic States, a cooperative program designed to restore and maintain salmon runs in favorable New England streams has been prepared. It is hoped that unified support will be accorded this program so that it may be put into effect in the near future.

Middle and South Atlantic fishery investigations.—Additional study of the Atlantic coast shad fishery provided confirmation of the opinion expressed a year ago—that the principal cause of depletion is overfishing rather than pollution or obstruction of runs, and that recovery can best be brought about by providing a spawning escapement in such depleted areas as the Chesapeake Bay and the waters of North Carolina which will be substantially equivalent to that which has proved adequate in the Hudson River. Investigations in 1939 also demonstrated the important fact that the moderate fishing rate in the Hudson eventually takes as many shad from each year-class as the more intensive fishery in the Chesapeake, but by spreading the catch over several years allows six times as much spawning from each year-class. Recommendations have been made to the conservation departments of Maryland, Virginia, and North Carolina to the effect that the fishery should be reduced to 60 percent of its present magnitude by restricting the amount of gear licensed.

As a means of securing greater yields and larger profits from each brood of striped bass, regardless of its relative abundance, the Bureau of Fisheries recommended the establishment of a minimum-size limit of 16 inches, measured from the snout to the fork of the tail. This recommendation was adopted by New York during 1939. A slightly higher size limit is in effect in New Jersey. Recommendations for substantial increases in the size limit have been submitted to the fishermen by the Virginia Commission of Fisheries and similar action

is expected in Maryland and North Carolina. A survey of Chesapeake Bay and the coastal regions from Virginia to southern New England showed that important striped bass spawning grounds are confined to the Maryland waters of the Chesapeake and Delaware Bays, and the lower Hudson River. According to previous surveys the lower Chesapeake Bay and the sounds and coastal rivers of North Carolina are also productive areas. These observations suggest that fishing for striped bass along the coasts of New Jersey, Long Island, and southern New England is maintained chiefly by migration of fish spawned in other areas. Investigations during the year provided further support for the view that production and survival of striped bass are to a large extent independent of the number of spawners; hence regulatory measures to increase the spawning stock are not of primary importance in the conservation of this species.

Long Island cooperative investigation.—Public interest aroused by the cooperative study in which the Bureau of Fisheries participated with the New York Conservation Department, as reported last year, caused the Boards of Supervisors of Suffolk County, and later of Nassau County, Long Island, to contribute funds for a similar cooperative study of local fishery problems. The investigation of the Suffolk County fisheries has been under way throughout the fiscal year 1940; that of Nassau County fisheries since May 20, 1940.

It has been learned that the flounder populations in different regions of Suffolk County are independent, so that measures to improve fishing conditions can be applied directly to individual areas. With the cooperation of pound-net fishermen, methods have been worked out for releasing a large percentage of small sizes of several species of fish taken in nets, thus permitting these young fish to reach a size at which they will be of greater value to commercial fishermen and anglers. The survey has disclosed also that the sport fisheries account for a considerable percentage of the total catch of several important species.

Shrimp investigations.—Because of the constantly increasing drain on the supply of shrimp, which is the most valuable fishery product south of Virginia, it has long been considered important to know whether or not there is a reserve supply available beyond the range of the present commercial fishery. This question has now been answered in the negative through the offshore explorations of the vessel *Pelican* in the Gulf of Mexico and along the South Atlantic coast from Fort Pierce, Fla., to Cape Hatteras, N. C. No concentrations of shrimp were found in either area outside the waters now being exploited, a fact which emphasizes the importance of measures recommended for the protection of the supply in inshore waters.

Tagging of shrimp in the Gulf of Mexico during the past year established the fact that here, as on the South Atlantic coast, the shrimp

move from the waters of one State to those of another, so that effective conservation of the supply must be accomplished by unified action of the States concerned. Clear evidence of interstate migrations was obtained in waters east of the Mississippi.

Surveys on the South Atlantic coast during the spring months of 1940 revealed a critical condition which threatened the production of a crop for next year's fishery. The number of spawners had been reduced to a dangerously low level through the operation of two factors: The excessive winter fishery in Georgia and Florida which draws upon virtually the entire South Atlantic population of large, migratory shrimp, and the unusually cold winter which killed large numbers of the small shrimp which do not migrate but remain in coastal waters as far north as North Carolina. Because of this drastic reduction of the stock, the cessation of all fishing until July 1 was recommended in order that the remaining shrimp might have an opportunity to spawn.

North Pacific and Alaska fishery investigations.—For the second consecutive year the activities of the Columbia River staff have been concentrated upon the problem of salvaging the portion of the salmon run which is barred from its accustomed spawning grounds by the erection of the Grand Coulee Dam. Salmon, steelhead trout, and other fishes bound for the upper Columbia River are being trapped as they pass through the fish ladders at Rock Island Dam, 150 miles downstream, and transferred to tributaries of the Middle Columbia where suitable conditions exist and where it is desired to build up the runs. Because the chinook and blueback salmon have a strong instinct to return to the streams in which they have spent the early months of life, it is expected that such trapping operations will be necessary only throughout one complete cycle of salmon runs. During the period from May 1 to December 9, 1939, 41,722 fish were hauled, of which 36,224 were salmon and steelhead trout. The loss of fish during trapping and hauling was extremely small and observations later in the season revealed successful spawning.

In the Puget Sound area, where the coho salmon are important both from the standpoint of food and recreation, returns of these fish from marking experiments conducted in previous years indicate that releasing fingerlings in the fall produces slightly larger returns and is less expensive than releasing them in midwinter, and is greatly to be preferred to releasing them in the spring of their second year.

Observations on the salmon populations of Bristol Bay, for the purpose of collecting data on which to base a program of management for this valuable resource, were made in 1939 for the second consecutive season. The study of the life histories of the races of salmon populating the lakes and rivers in a watershed of over

35,000 square miles consisted of regular samples of seaward migrant fingerlings taken at five points selected for the purpose. Fingerlings were marked for future identification and released wherever they were available in sufficient numbers, and scale samples, body measurements, weights, and information on sex proportions were obtained from each of the principal rivers during the commercial fishing season. Investigations at sea included experimental fishing and tagging to determine the feeding grounds and migratory routes followed by the adult salmon as they make their way in to the rivers to spawn.

Investigation of the decline in productivity of the Karluk River watershed has revealed that, while the mortality of salmon during the period of life in the sea is remarkably constant, great variations in the percentage of mortality in fresh water are to be expected. These variations are related to changing environmental conditions and to cycles in the fertility of the lake and the abundance of food organisms. A report on the phases of this investigation that are now completed has been prepared for publication.

The existence in the Karluk system of at least two separate populations of the Dolly Varden trout, which prey to some extent on red salmon, has been demonstrated by tagging. Since one of the populations is resident within the lake and the other migrates annually to and from the ocean, control measures, if found necessary, would differ for the two groups.

Improved facilities have now been provided for the study of the pink salmon, which is by far the most abundant species of salmon in Alaska and hence an important source of food. Because of the short life cycle of this species (2 years) it is possible to build up or decimate a population of pink salmon within a short time, hence the need for continued watchfulness. A combination dam and counting weir is now in operation at Little Port Walter, making possible observations that will be used to compute the percentage of mortality in both fresh and salt water. A permanent biological field station has also been established so that biological observations on the survival of the broods may be made throughout the year, permitting more accurate predictions as to the size of the annual runs.

Throughout the year the collection, tabulation, and analysis of the daily catch records of the various types of fishing gear operated by the salmon fishery of Alaska were continued, contributing to an invaluable permanent record of the fishery throughout the Territory. Indices of abundance derived from these data are an important basis for recommendations for changes in the fishing regulations.

The collection of statistical and biological data on the Alaska herring fishery has been continued with a view to safeguarding the supply,

which is now utilized principally in the preparation of oils and meals. Although large catches have been made in certain areas, several facts suggest the need of closer supervision of the fishery. Among these are the lack, in the Kodiak area, of any appreciable increments to the stock as a result of spawning in recent years, added to increased fishing intensity and the observed decline in return per unit of gear. Large catches have been made also in Prince William Sound, but here again the yield is being maintained only by increasing the fishing effort. The catch in southeastern Alaska in 1939 was the lowest since the inception of the intensive reduction fishery 15 years ago. This decline is the result of excessive exploitation combined with the failure of several spawning seasons. In an effort to rebuild the stock, fishing in the Cape Ommaney area was prohibited during the 1939 season, and all fishing for reduction purposes was prohibited in southeastern Alaska during 1940.

Pacific pilchard investigations.—The object of investigating the pilchard fishery of California, Oregon, and Washington is to determine how large a catch may be made annually without jeopardizing future yields. Recognition of an irreversible decline is made difficult by the existence of natural fluctuations in abundance and variations in the availability of the fish to the vessels. For these reasons evidence on many aspects of the fishery and on the biology of the pilchard populations is necessary and is being collected.

Accurate means of determining the age of pilchards has heretofore been lacking, a fact which has hindered the determination of the contributions made by the various spawning seasons to the commercial stock. Intensive experiments conducted by the staff during the past two years have now disclosed a method of defining and interpreting age marks on the scales of juvenile pilchards through the third year of life, and probably of older fish as well, thus providing an indispensable tool of pilchard research.

Surveys to determine what oceanographic conditions control the survival of young pilchards and to discover the extent of spawning areas and the amount of spawning were carried out with the cooperation of the Scripps Institution of Oceanography during the 1939 and 1940 seasons. During the 1940 survey, pilchard eggs were found over the entire area of 1,800 square miles covered by the survey—from San Diego to about Point Conception—although the maximum spawning seemed to have occurred in a zone parallel to the coast and lying 50 to 100 miles offshore. The location of the spawning area appears to correspond to certain hydrographic features. Data collected will permit computation of the total number of eggs in the area explored and an estimate of the size of the spawning stock. Repeated and extensive surveys of this sort are necessary to determine whether the spawn-

ing stock is being maintained at a sufficiently high level to provide adequate replacement for the toll taken by a large and intensive fishery.

While no final conclusions as to the status of the pilchard stock can as yet be drawn, certain facts are evident. During the 1937-38 season, for the first time, the supply failed to equal the demand. During this season also the relatively low catch was accompanied by a decrease in the proportion of large fish in the catch. Without further information these facts do not constitute conclusive evidence of depletion but nevertheless suggest that the pilchard industry has reached the point where further expansion can result only in a rise of production cost.

Great Lakes fishery investigations.—Members of the staff continued their active cooperation with State and Federal officials and with sport and commercial fishermen, participating in meetings and conferences in which Great Lakes fishery problems were under consideration and assisting State conservation officials in the drafting of fishery regulations. One of the significant events of the year was the revision of the commercial fishery regulations for the State of Wisconsin waters of Lake Michigan, which, although at present the subject of litigation instituted by certain fishermen, constitutes another important step toward the attainment of uniform regulations for all waters of that State. An event of even more widespread interest and significance was the appointment, on February 29, 1940, of an International Board of Inquiry for the Great Lakes Fisheries. The Board will undertake a study of the fisheries and will submit recommendations as to means of conserving and developing the fishery resources, possibly by international agreement.

Detailed information on fluctuations in the production and abundance of important commercial species and on the intensity of the fisheries of Lake Michigan has now been compiled for a 10-year period. These data have revealed, among other facts, a pronounced decline in the production and abundance of whitefish in Lake Huron in 1938, in which year the abundance index of this fish was only 29 percent of the 1929-34 average. Although recommendations had been made by the Bureau for the control of the deep trap-net fishery for whitefish, no effective measures were adopted until the fishery had sustained damages that possibly are irreparable.

Much of the attention of the staff was given to analyzing data previously collected and to preparing reports on investigations that are now completed. Among these was a report on the fishery resources of the Red Lakes, which constitute one of the principal sources of livelihood for the Red Lake Indians. No positive evidence of a decline in abundance was found. Recommendations were offered for the proper management of these fisheries, based in part upon studies of

the growth rates of the various species which indicate the minimum size at which it is desirable to subject these fish to commercial exploitation. Another study which has now yielded useful information is an extensive tagging project carried out in cooperation with a commercial fishing firm of Port Washington, Wis. Of the 2,902 Lake Michigan fish that were tagged and released, 38 percent were recaptured, the results disclosing important information on the extent of migration and the intensity of fishing operations. A study of the age and growth of the yellow perch of Saginaw Bay indicates that the present legal length of 8½ inches possibly is too low, inasmuch as yellow perch of both sexes attain this length just as they are entering on the period of most rapid increase in weight.

Shellfish investigations.—Research on oysters was conducted during the year, in accordance with the established policy of the Bureau, (1) to increase technical knowledge of the methods of propagating oysters under various conditions in the coastal waters; (2) to find practical means of improving the quality of marketable oysters; (3) to improve methods of protecting oysters against various pests and parasites; and (4) to determine the effects of pollution and devise means of rendering certain trade wastes harmless to oysters.

Studies of the factors controlling the spawning of oysters have revealed that the old concept of a single critical temperature that induces spawning in oysters is no longer tenable. Depending on the physiological state of ripeness which may be influenced by proper chemical stimulation, the oyster may spawn at various temperatures ranging from 63° to 95° F. These physiological studies have provided a key to a practical method of controlling the spawning of oysters under natural conditions.

In compliance with the request of local oystermen, the Bureau's Milford (Conn.) Station has continued its custom of issuing weekly bulletins on the physiological condition of the oysters in Long Island Sound and the expected time of setting. To this information there have now been added reports on the distribution and abundance of starfish, the principal oyster enemy in this region.

Experiments in North Carolina demonstrated the value and practicability of growing oysters in improved marsh ponds and canals where the depth and velocity of the currents can be controlled. In such areas it is possible to prevent the "smothering" of seed obtained from the early summer spawning by the spat of the September spawning. Even from poor quality seed a growth in volume of over 300 percent was obtained during the first year. By holding seed in special trays it was found possible to cultivate oysters at concentrations equivalent to over 2,000 bushels per acre. These experiments are being continued and developed on a small commercial scale to

determine the maximum size and age obtainable by oysters in these waters and the percentage of mortality to be expected according to age and environmental conditions.

Operation of an experimental oyster farm in South Carolina is providing considerable information on the relative value of the various types of bottom for seed-oyster production. On the Gulf coast, where oyster production has been at a low level for a number of years, the staff is cooperating with oystermen and with State conservation departments in formulating programs for the development and maintenance of natural oyster grounds and for the creation of new grounds by planting shells and seed oysters.

Methods of controlling starfish were tested under a variety of field and laboratory conditions by the staff and are being put into practice by many New England and Long Island oyster growers in a vigorous effort to diminish the losses caused by this abundant animal. Oyster drills, which are a serious menace to oysters in the Middle Atlantic States and are now becoming more numerous in Long Island Sound, have been found capable, when only 1 month old, of destroying approximately five oyster spat a day. Because of the heavy depredations of the boring clam, another oyster enemy found in Gulf coast waters, an investigation of the life history of this little-known mollusk has been undertaken at the Pensacola (Fla.) Station.

The study of the effects of pulp-mill pollution on the oysters of the York River, Va., has been completed and a final report on this investigation will be made early in the fiscal year 1941.

Sponge investigations.—During the summer of 1939 samples of diseased sponges were received from Florida and subjected to microscopical examination. All were found to be infected with the fungus organism that had been discovered and tentatively identified during the preceding year by one of the Bureau's biologists in surveys of the Bahama Island waters and the Florida Keys. From Key West, where the disease first manifested itself in the United States, it spread to Tarpon Springs, and by the end of December mortality of commercial sponges had proceeded to such a point that fishing was discontinued on bars situated below eight fathoms. At the end of the calendar year 1939 the number of sponges brought to the Tarpon Springs Sponge Exchange had noticeably diminished, causing considerable concern for the future of this resource. During the spring of 1940 there was evidence that the disease had abated and that a large crop of small sponges was in evidence. However, two or three years may be required for a substantial restoration of the commercial-sized supply.

Aquicultural investigations.—Studies concerned with the management of fresh-water sport fisheries are conducted along three prin-

cial lines. The first is related to the artificial propagation and rearing of game fishes; the second to the problem of controlling the parasites and diseases of fish which frequently curtail the output of hatcheries; and the third to field problems relating to fish management, such as the comparative survival and growth of hatchery and wild trout under natural conditions, the ecological requirements of different species of game and food fishes, and the possibility of increasing fish production in natural waters.

In connection with studies of the artificial propagation and rearing of trout, progress has been made toward developing economical diets without sacrifice of growth. Other experiments have demonstrated that overfeeding of trout brood stock is distinctly detrimental in that it reduces the number of eggs that hatch, while experiments in selective breeding have more than doubled both the rate of growth and the production of eggs.

Studies of the pond culture of largemouth black bass were carried on in Florida with a view to determining the role of fertilizers and forage fish as they affect the production of bass fingerlings per acre. Similar work on a somewhat smaller scale has been conducted in West Virginia. Here, also, field studies of the spawning and survival of smallmouth black bass are being made in selected tributaries of the Potomac River.

The most important result of the studies in fish pathology during the year was the development of a safe, practical, and economical method of controlling the external parasites of fish. Other investigations contributed to an understanding of the causes and prevention of the Western type of gill disease and of the importance of several parasites of trout and bass. In addition to the hatchery studies, losses among wild fish in the field were investigated by the staff. The most important problem of this nature that is currently under study concerns the attacks of fungus organisms which inflicted considerable losses on adult chinook salmon and steelhead trout liberated in the Entiat River in connection with the Columbia River salvage operations.

Fish-management studies on trout waters were carried on at the Pittsford (Vt.) and Leetown (W. Va.) Stations, in the Pisgah Game Preserve in North Carolina, and in Utah, Idaho, and California. One of the surprising results of the "test water" studies conducted in Vermont is the finding that fishing is maintained chiefly by natural reproduction of wild fish, and that stocking with hatchery trout has had little effect. Under conditions obtaining in those waters, stocking with legal-sized fish in the fall has been found to be wasteful, and tests are being made to discover whether stocking with smaller fish will yield better results. In the Pisgah Game Preserve, where the

Forest Service has complete control over all streams, management programs worked out by the Bureau of Fisheries have been in operation. Good results were already apparent in 1939, and during this and the 1940 season it was possible to accommodate more anglers and to permit a longer open season than in previous years. Management studies in the intermountain region have been concerned chiefly with the fisheries problems of Fish Lake, Utah, and of Bear Lake, which is situated almost equally in Utah and Idaho. In California, while experiments on the survival of hatchery trout after planting are still under way, the attention of the staff has been given principally to the problem of devising a plan for salvaging salmon whose migration will be blocked by the Shasta Dam. This dam will be approximately 560 feet high and will cut off all salmon spawning areas above it in the Sacramento, Pit, and McCloud Rivers and their tributaries. The value of these salmon runs has been calculated at \$95,000 annually in returns to commercial fishermen. After surveys of potential spawning areas below the dam and of possible sites for trapping the runs for transfer to such areas, a preliminary report embodying recommendations for the salvage operations was issued in June 1940.

Water quality investigations.—One of the major activities of the aquatic physiologists during the past year was a study of the effects of various components of larvacides and herbicides on fresh-water fishes and their associated aquatic food organisms. These studies have now provided evidence that in waters treated with even small quantities of arsenicals and several other materials commonly used as mosquito larvacides, there is impairment of the growth and nutrition of fishes.

Application of physiological, biochemical, and metabolic methods to the study of fishes from irrigation waters has demonstrated that the physiological condition and reproductive capacity of such fish is often below par, a condition traceable to the concentrations of mineral salts discovered in many return irrigation waters. The same methods of study applied to fishes from waters polluted with mine wastes revealed that chronic injuries result from much higher dilutions of the wastes than heretofore have been recognized.

During the summer of 1939 intensive studies of stream pollution were made along the Atlantic seaboard and throughout the greater part of western United States, resulting in the collection of much new information on the nature and effects of polluted waters.

Studies of impounded waters were continued at Elephant Butte Reservoir in cooperation with the Reclamation Service and the National Research Council, and at Lake Mead in cooperation with the same agencies and the National Park Service.

Protection of fish runs from engineering developments.—The establishment, early in the year, of a section on hydraulics within the Division of Scientific Inquiry provided for the application of biological and engineering skill to fishery problems created by the construction of dams, reservoirs, and diversions for the purposes of power, irrigation, navigation, and flood control.

The work of the Hydraulics Section during the first year of its existence has been devoted to three general phases of fish protection: (1) Supervision of the construction of four large fish screens in Federal irrigation canals and the operation of Federal screens already constructed; (2) consultative services in connection with fish-salvage problems at the Shasta Project on the Sacramento River; and (3) the review of Federal water projects from the standpoint of fish protection. Advice in connection with fishway and screen problems has also been furnished the conservation agencies of several States.

APPROPRIATIONS

Appropriations for the Bureau for the fiscal year aggregated \$2,259,400, as follows:

Salaries, Bureau of Fisheries-----	\$183, 000
Propagation of food fishes-----	949, 400
Construction of fish screens-----	10, 000
Maintenance of vessels-----	214, 000
Inquiry respecting food fishes-----	322, 000
Fishery laboratory, Little Port Walter, Alaska-----	7, 500
Fishery industries-----	80, 000
Fishery market news service-----	76, 000
Alaska fisheries service-----	268, 200
Enforcement of Black Bass and Whaling Treaty Acts-----	17, 000
Mississippi Wild Life and Fish Refuge-----	17, 000
Library-----	600
Travel expense-----	114, 700
Total-----	2, 259, 400

GRAZING SERVICE

R. H. Rutledge, *Director*

World events during the past year brought to American citizens a deeper realization of the significances of range conservation to our national welfare. The vital importance of a continuous, adequate supply of food and clothing to meet the needs of citizens under possibly extraordinary conditions was recognized. Protection and wise use of the source of these products took on a new and realistic meaning in our national planning. Conservation of the Federal grazing lands from which is derived a large part of the meat, wool, and leather essential to our continued well-being was accepted as an important and integral part of our national-defense program.

The Grazing Service exerted an important influence on western land use planning during the fiscal year just closed. Considering the importance of all land resources to a permanent program of national preparedness and economic welfare, the program was given added significance.

As custodian of 142,000,000 acres of public lands in 10 Western States, this Service directed its program toward the main objectives necessary to bring about coordinated use and planning for resource conservation. Not only was this effort directed to the public lands but also to correlating that use with 125,000,000 additional acres of State, county, and private lands intermingled with the public lands. Planning included management collectively with all related agencies, groups, associations, and individuals in an effort to harmonize this use in the greatest public interest.

Industrial and military forces of the national program must be adequately clothed and fed. In this connection the stockmen of the west realizing that they have a dual responsibility looked to the Grazing Service for guidance. Working together with stockmen, farmers, sportsmen, agencies, industries, and groups the Grazing Service has taken the position that something deeper than the grazing of livestock underlies the whole job of public-land administration.



GRAZING CONSERVATION AIDS DEFENSE.

Better forage and more water for livestock on 142,000,000 acres of Federal range is the constant aim of the Grazing Service. Upper: Meat and hides for the Nation are furnished by cattle in operations like this typical scene from the western range country. Lower: Wool for some uniforms in the future is grown on the hoof in grazing districts supervised under the conservation program of the Department of the Interior.

There is a united feeling throughout the organization that in performing the leadership in a great cooperative undertaking it is doing more than merely promoting governmental stewardship of national resources. Its policies and program must take into consideration the welfare of producers and consumers alike. The program is at once a crusade for better things and a defense of the land—one of America's greatest heritages. The best results in any undertaking are obtained by voluntary, spontaneous cooperation of a free people. Continuing that principle there was placed additional emphasis on the value of submitting important questions to the people for consideration. With that principle firmly established in the Grazing Service its activities during the year were directed mainly to planning and leadership in land use as it concerns both the users and the resources. Through this means there has been incorporated into the program active participation by more than 20,000 stockmen and numerous other citizens whose economic and social well-being depends on continued wise production of livestock and its products.

Thus, in facilitating this production and to aid in its mobilization to centers of consumption, processing plants and shipping points the Grazing Service is an important civilian arm of defense.

Peacetime efforts must be aligned adequately with war-time possibilities. That policy must have considerable flexibility. But the major objective—national defense—must never be compromised. In the light of these facts the Grazing Service has reexamined its program in terms of national preparedness and national defense. Out of that reexamination there appeared the question—How can this program be geared to meet the national program of preparedness?

Immediate preparedness efforts are focused on guns, planes, tanks, ships, and men. Back of these items are the immediate and longtime needs for essential raw materials. Meat, wool, mohair, and leather loom large in the picture. The range conservation program places the livestock industry in much better position than ever before to meet present and future emergencies. Production can be kept on a stabilized and continuing basis without repeating the mistakes of range abuse made during the first World War.

With the help of 20,000 users and 555 district advisers the range program can be kept at a high productive level without injury to resources involved.

Should the need arise, equipment such as trucks and tractors manned by skilled operators can be utilized locally for noncombatant purposes.

Maps and radio communication can be made useful for intelligence purposes, for example:

Western range areas already mapped include sites for Army maneuvers, border patrol, bombing ranges, and air navigation bases. Such maps also show culture such as roads and towns as well as important topographic features. Assembled on a large usable scale, these maps are available at field drafting offices located at Reno, Nev., Albuquerque, N. Mex., and Salt Lake City, Utah.

Roads are peacetime investments that will pay wartime dividends. The Grazing Service has developed over 6,000 miles of minor roads and truck trails, feeders between outlying areas and main highways. Experience in road building and maintenance, together with equipment and manpower can be marshalled and put to immediate non-combatant use if necessary. In the case of emergency, Grazing Service personnel is available for patrol duty to guard roads, structures, bridges, reservoirs, and water supplies until the military organization takes over.

One hundred ten C. C. C. camps containing all necessary facilities for 200 men each are distributed in the 53 grazing districts. Eighty-nine of these camps are now occupied and the remainder are being held for future occupancy. Should the need arise these portable buildings can be converted readily into Army barracks. The equipment now available plus manpower to operate and maintain it includes 237 dump body trucks, 1,058 stake body trucks, 159 tractors, 111 graders, 115 rotary scrapers, 50 portable compressors, 83 road rippers, 38 concrete mixers, and 24 well-drilling rigs.

Within the boundaries of grazing districts are many known undeveloped mineral deposits and a number of mines producing vanadium, antimony, molybdenum, manganese, and other ores essential to the defense program. Ready access to such deposits may be necessary in the near future and men will be needed to assist in their development. In the Grazing Service camps are foremen with experience as mine managers, mine engineering, and hard-rock mining. The Service is prepared to open truck trails to mining properties, build temporary roads to aid the production of war-essential minerals, and actually produce and haul ore.

GROWTH OF THE GRAZING SERVICE

Six years ago, on a hot July day, about 800 people crowded into a hotel auditorium in Salt Lake City, Utah, to hear for the first time facts concerning the Taylor Grazing Act of June 28, 1934.

On the platform was a group of Interior Department officials, headed by Assistant Secretary of the Interior Oscar L. Chapman.

These men had come to explain the objectives of the new public land law and to obtain from the people suggestions for its operation.

The auditorium was filled with people who represented the true cross-section of the West. These people were eager to learn; anxious to participate; and deeply concerned as to how the grazing law was to affect farmers, stockmen, and the range itself.

How will the Taylor Grazing Act work on the ground? was the paramount question in the minds of citizens in the West. Likewise this question was paramount in the minds of Department officials.

The setting for this historical meeting was both dramatic and significant. The entire West was in the midst of a great drought, one of the worst of record. Many water holes had dried up, water storage in reservoirs was low, fields were parched, crops were failing and many livestock were dying of starvation.

Western stockmen had made repeated attempts to obtain legislation for the control of grazing on the public domain. They had a big stake in whatever program was adopted. Their discussions were straightforward, sometimes heated but uniformly centered around practical problems in the range country.

For example, Nevada people wanted to know how the act would affect important water policies in that State. Cattlemen from Colorado wanted to know how they would be protected against existing migratory range practices. Utah people asked if they would obtain protection against overcrowding of winter ranges. New Mexico people wanted to know if established stockmen in that State would be disturbed by range redistribution policies. The homesteader wanted to know if this act would establish him in the livestock business. Sportsmen and wildlife interests inquired about the welfare of game. These and hundreds of related questions focused many problems for discussion and consideration.

Out of that meeting was developed a plan for cooperation between stockmen and the administration, which has characterized the pattern of range conservation throughout the 53 grazing districts of the 10 Western States.

Six years have witnessed a steady advance toward the ultimate goal of the Taylor Grazing Act, namely, preservation and orderly use of the natural resources and stabilization of the livestock industry dependent upon the public lands. Such advance is due largely to local participation through "home rule on the range." The appointment by the Secretary of the Interior of advisory boards of stockmen in all grazing districts took the problems right out on the ground for solution. This democratic approach to cooperation and understanding proved successful both from the standpoint of

the administration and that of the stockman. Accordingly, under the sponsorship of the range users themselves "home rule on the range" was written into the law itself during the early part of the fiscal year when Congress made the advisory board system a permanent feature of grazing administration "in order that the Secretary of the Interior may have the benefit of the fullest information and advice concerning physical, economic, and other local conditions in the several grazing districts."

ORGANIZATION

In August 1939 the Secretary of the Interior changed the name, "Division of Grazing," to "Grazing Service."

The Grazing Service is exactly what the name implies—a service agency on range matters. It manages the public lands chiefly valuable for grazing and correlates the use thereof with that of related properties, both State and private, for the stability of western homes. It renders advice and assistance on range problems to people concerned and to other agencies in the Government. Operating under laws and policies designed primarily for resource conservation and for the welfare of the dependent population, its administration and action programs are correlated by the Secretary with those of other agencies in the Department.

In line with the national program of better land use its activities directly affect millions of people and more than 250,000,000 acres of land in the far Western States. The chief concerns of the Grazing Service are to see that the range is protected and people's interest adequately safeguarded. Fundamental in this connection is a prosperous livestock industry stabilized around proper, orderly use of the public lands.

The organization plan approved by the Secretary of the Interior on May 13, 1939, was put into effect at the beginning of the fiscal year. This plan proved advantageous from standpoints of public service, efficiency, and economy. Definite progress was made in orientation of personnel on lines of authority, responsibility, and accountability. Action programs were solidified in the field under the regional graziers.

Plans, policies, and procedure were coordinated by the Director in Washington through four principal administrative branches, namely:

1. Branch of Operations.
2. Branch of Range Management.
3. Branch of Land Acquisition and Control.
4. Branch of Range Improvements and Maintenance.

Delegation of specific duties resulted in better service to the people and greater accomplishment despite the fact that owing to lack of funds, many authorized positions remained unfilled.

OPERATIONS

The new set-up functioned smoothly during the first year of its complete service and with further training, especially in the field, the whole organization, although understaffed for the size of the job, will be in better position to perform the jobs assigned to it.

The administrative staff was increased by 38 members during the fiscal year. The additional personnel was assigned largely to field offices to strengthen local administration, to patrol range areas, and to assist with administration on the ground. In addition to the regular staff, there are 555 district advisers, 74 less than were on the rolls during the previous year.

The reduction in advisory board members followed provisions of the amendment to the Taylor Grazing Act passed July 14, 1939. This amendment limited advisory board memberships to not less than 5 nor more than 12 in each grazing district. As a result new elections were held in all grazing districts during the year. Approximately 80 per cent of the incumbent membership was reelected by the stockmen. On each board there is also a wildlife representative appointed by the Secretary of the Interior upon the recommendation of the appropriate State fish and game official.

The duties of district advisory boards are recommendatory and their services are rendered periodically throughout the year at the call of the regional grazier.

Upon the transfer from the General Land Office to the Grazing Service of functions involving the handling of collections and disbursements of funds, a standard system of fiscal accounting was installed effective as of July 1, 1939. This system enabled the Grazing Service to maintain an accurate current record of all receipts and expenditures pertinent to the consummation of these functions.

Congress appropriated \$650,000 for operating expenses of the Grazing Service during the year. In addition, \$100,000 was provided for payment of travel and per diem of district advisers. The small increase of \$100,000 over the previous year did not, however, enable the Service to keep pace with the expanding program. The average grazing district is about the size of Connecticut and the 53 districts have a gross area of more than 250,000,000 acres. To plan, manage, and execute a program of protection, improvement, and orderly use of this vast area, the Service was allotted only three-tenths of 1 cent per acre.

Receipts from grazing fees in the 53 grazing districts totaled \$786,204.95 during the year, listed by States as follows:

Arizona-----	\$37, 509. 31	Nevada-----	\$124, 873. 65
California-----	23, 946. 93	New Mexico-----	142, 001. 95
Colorado-----	50, 561. 56	Oregon-----	40, 789. 41
Idaho-----	67, 324. 29	Utah-----	131, 449. 23
Montana-----	35, 799. 79	Wyoming-----	131, 948. 83

The total 6-year cost of administration through June 30, 1940, was \$2,668,000. Grazing fees in that period have totaled \$3,069,227.10, exceeding the cost of administration by \$401,227.10 or 13 per cent. Income from grazing districts can be expected to increase when the Service has been expanded to meet requirements and the carrying capacity of the range has responded fully to the management it deserves. The nominal grazing fees now in effect are admittedly out of line with potential values. Likewise the funds provided for operation are completely out of line with the public values involved.

LANDS

Security in land tenure is the biggest problem facing the livestock man of the West today. If he is to plan and manage his business successfully he cannot be confronted constantly with the hazard of competitive leasing of strategic areas. Neither can he cope with unstable land policies that are naturally inherent in diversified control. To meet these problems both from the standpoints of land use and economy in conservation the Grazing Service took definite steps during the year to improve and stabilize the land pattern in grazing districts.

An analysis of the landownership pattern in grazing districts resulted in the establishment of a general policy to—

(1) Discourage further private acquisition of public land unless such land has inherent or special use values higher than public values.

(2) Consolidate public ownership wherever possible to facilitate administration and promote conservation.

(3) Coordinate use and management of Federal and non-Federal lands through local agreements and cooperative planning.

(4) Promote stabilization of the livestock industry by stabilizing the control and the tenure of interdependent public and nonpublic land.

Steady progress toward these objectives was made during the year. Negotiations are usually initiated by the owners themselves, which testify to the sound principles of the Taylor Grazing Act.

Four principal methods are used to carry out the land-use program:

(1) Cooperation with agencies, States, stockmen's associations and individuals.

(2) Exchange of use agreements. This method is used to consolidate or block areas into suitable administrative units without effecting change of title.

(3) Exchange under section 8 of the act.

(4) Lease under the Pierce Act of June 23, 1938. Under this act the Secretary of the Interior is authorized to lease State, county, or privately owned grazing lands in grazing districts when the lease of such lands will promote the orderly use of the district and aid in conserving the resources of the public lands.

ESTABLISHMENT OF GRAZING DISTRICTS

Three additional grazing districts were established during the year, one each in Montana, New Mexico, and Utah, bringing the total number of districts to 53. The Federal range administered by the Grazing Service totaled at the end of the year 140,847,900 acres, an increase of 6,369,993 acres over the previous year. In addition to vacant lands grazing districts contain State, county, and private lands, and other public lands included in prior withdrawals, such as stock driveways, power-site reserves, military reserves, public water reserves, naval oil-shale reserves and reclamation withdrawals, all tied together in the general-use pattern. A general ownership breakdown of grazing districts is shown by tabulation.

MISCELLANEOUS GRAZING DISTRICT MODIFICATIONS

Effective during the year were 13 orders eliminating 125,897 acres of public land from 10 grazing districts to be used for other public purposes. In this category are lands needed to perfect park and forest boundaries; to enlarge the Black Canyon National Monument in Colorado (2,760 acres); sites for air navigation, areas for use in Federal reclamation, and areas primarily suitable for wildlife protection. Additions to 6 grazing districts involved 38,583 acres of public land, a large part of which was formerly withdrawn for State Carey Act projects. Certain stock driveways established under the Stockraising Homestead Act of 1916 were revoked and made available for grazing administration in California, Colorado, Idaho, and New Mexico. The area involved in these revocations totaled 234,358.35 acres of public land.

Status of Grazing Districts—Approximate Acreages, 1940

State	Number of districts	Gross area	Vacant unappropriated public land	Other public lands	Total administered by Grazing Service	Other lands ¹
Arizona.....	4	15, 179, 000	9, 011, 697	640, 099	9, 651, 778	5, 527, 222
California.....	2	8, 072, 800	3, 209, 095	844, 199	4, 053, 294	3, 969, 506
Colorado.....	5	15, 863, 500	6, 520, 316	580, 439	7, 100, 755	8, 762, 745
Idaho.....	4	21, 914, 300	11, 232, 943	586, 900	11, 819, 933	10, 094, 367
Montana.....	6	32, 045, 930	4, 917, 826	996, 558	5, 914, 384	26, 131, 516
Nevada.....	5	45, 942, 400	34, 073, 296	526, 682	34, 599, 978	10, 942, 422
New Mexico.....	6	37, 629, 100	14, 612, 786	733, 869	15, 346, 655	22, 282, 445
Oregon.....	7	20, 924, 900	11, 916, 520	61, 850	11, 978, 370	8, 945, 530
Utah.....	9	38, 370, 900	24, 544, 822	2, 142, 897	26, 687, 719	11, 683, 181
Wyoming.....	3	21, 735, 700	12, 743, 405	953, 629	13, 697, 034	8, 038, 066
Total.....	53	257, 678, 500	132, 782, 688	8, 067, 212	140, 847, 900	116, 830, 600

¹ Mainly State, private, railroad grant, county, and other prior Federal withdrawals.

PIERCE ACT LEASES

Regulations promulgated during the fiscal year made the Pierce Act effective in all grazing districts. The leasing program under this act will serve a multiple purpose:

(1) It enables the Secretary of the Interior to place large areas of non-Federal grazing lands under proper use and administration without added cost to the owners or to the Government.

(2) It promotes conservation of such lands under regulation of the Taylor Grazing Act.

(3) It enables the Grazing Service to make uniform plans for watershed protection, erosion control, and other conservation activities on lands of interspersed ownership.

(4) It promises to increase revenues to States from school lands in the 10 Western States.

Stockmen themselves operating under Federal license will pay grazing fees for the use of such lands. One lease for 125,000 acres of county tax-delinquent land in Oregon is already in operation. Active steps are now being taken to perfect leases of this nature in Arizona, Colorado, Idaho, Oregon, Utah, and Wyoming. Preliminary estimates indicate that there are at least 20,000,000 acres of State, county, railroad, and individually owned land in grazing districts subject to the provisions of the Pierce Act.

LAND CLASSIFICATION

To protect the public interest and at the same time to afford individuals full exercise of their rights under applicable land laws, rigid standards of classification are maintained in the Grazing Service for proper disposal and management of public lands.

That the full force of the Stockraising Homestead Act has spent itself is indicated by the fact that during the year only 810 acres of land was designated under that act in 4 States, increasing the outstanding area in 21 states to 102,446,620 acres. The pendulum has swung toward applications for special uses, for exchange, for rights-of-way, and for water conservation and use through appropriate classification.

At the beginning of the fiscal year there were 505 cases pending under sections 7, 8, 14, and 15 of the Taylor Act. During the year 492 cases were received, making a total of 997 cases to be acted upon. Of this number 650 cases were disposed of by appropriate action, leaving 347 cases pending at the close of the fiscal year. On the other hand, there were only 43 water cases and no special-use applications pending at the beginning of the year. During the year 513 projects and applications of this nature were received of which 191 were pending action at the close of the fiscal year. During the year 1,240 acres in 6 States were included in water reserves and 1,210 acres in 4 States were excluded from such reserves, increasing the gross public water reserve area in 12 States to 513,686 acres.

COOPERATION

With expanded scope the Grazing Service cooperated with agencies, groups, associations, individuals, States, and counties interested directly and indirectly in problems affecting the western range areas. Railroads and other large landowners aided materially in promoting proper use of land and resources. Licensees and permittees cooperated in a mutual crusade for better range, clearer streams on the watersheds, a healthier livestock industry, and better living conditions in the Federal range territory. Through all these efforts many complications were avoided, proper management was expedited, and real progress made toward accomplishing the objectives of the Taylor Grazing Act.

Government agency participation included action programs in specific areas, agreements for future action, and correlation of policies for the general benefit of the dependent population and the resources involved. Cooperative agreements were entered into with the Bureau of Reclamation, the National Park Service, the War and Navy Departments affecting public lands in grazing districts. Agreements with other agencies such as the Soil Conservation Service, the Fish and Wildlife Service, and the Forest Service were continued. Policy programs for expeditious handling of land problems under applicable law were coordinated in the General Land Office. The Bureau of Ento-

mology helped on the eradication of destructive insects, the Forest Service contributed on developing fire-protection facilities and in training fire-fighting crews. Assistance was received from the Bureau of Plant Industry in the eradication of poisonous plants from the Federal ranges. States agencies and district advisory boards contributed immeasurably to perfecting the mechanics of administration in the varied localities.

The Civilian Conservation Corps and the Army in all corps areas were instrumental in the success of the C. C. C. camp program, enabling the Grazing Service to render a wide range of useful services to the public as well as to conduct successfully a well-rounded range-improvement program in the districts. State colleges assisted in the study of specific problems in widely scattered areas, and in many States these institutions cooperated with the Grazing Service and the Bureau of Agricultural Economics in the analysis of economic problems as they relate to range management.

The 28 cooperative grazing associations in Montana operating under agreements with the Secretary of the Interior were active in fostering unified management and control of intermingled Federal and non-Federal lands in grazing districts in that State. Cooperation was strengthened by the Montana Grass Conservation Act of 1939, which created the Montana Grass Conservation Commission, authorized to cooperate with the Secretary of the Interior in accordance with provisions of the Taylor Grazing Act.

COOPERATION WITH THE SOUTHERN PACIFIC LAND CO.

The Grazing Service entered into a cooperative agreement with the Southern Pacific Land Co. for the administration and proper use of all the unleased lands of that company situated in the State of Utah, amounting to approximately 220,000 acres. This agreement proved mutually advantageous to the Service and to the established livestock operators in the district.

An agreement was negotiated with the same company, providing for an exchange of use on "checkerboard" areas in the State of Nevada. This agreement affects approximately 2,000,000 acres of company land and an equal area of public land and enables the Grazing Service to block areas of grazing lands into suitable administrative units beneficial to licensees and to the Service.

COOPERATION WITH THE BUREAU OF RECLAMATION

A cooperative agreement was entered into with the Bureau of Reclamation whereby undeveloped lands withdrawn for reclamation purposes are to be administered for grazing and made revenue-produc-

ing pending the time that Bureau irrigates the lands or needs them in connection with necessary structures or reservoirs. Under this agreement an additional area of approximately 10,000,000 acres within the boundaries of grazing districts may be administered for grazing purposes.

COOPERATION WITH THE NATIONAL PARK SERVICE

Under certain conditions grazing lands in park reservations may be utilized for livestock. To meet these conditions and to assist in proper utilization of the lands the Grazing Service and the National Park Service entered into an agreement which enabled field representatives of the two services to work out local problems of this nature. Progress was made in Arizona and Colorado where certain park or monument withdrawals embrace large areas of usable grazing land.

COOPERATION WITH OFFICE OF INDIAN AFFAIRS

Cooperative agreements with the Office of Indian Affairs provide for administration by the Grazing Service of certain Indian withdrawal lands pending legislation effecting their final disposal. Under such arrangement, the Chaco District (New Mexico No. 7) was established during the fiscal year. Satisfactory progress in conservation, development, and orderly use of this 3,500,000-acre area resulted from the first year's operation of this district. This is an outstanding example of cooperative work for the benefit of the dependent population.

Large areas of Indian lands in Utah and Arizona were placed under protection and beneficial use through separate agreements with the Office of Indian Affairs.

COOPERATION WITH BUREAU OF BIOLOGICAL SURVEY

Activities in cooperation with the Bureau of Biological Survey which on July 1, was combined with Bureau of Fisheries to form the Fish and Wildlife Service, United States Department of the Interior, brought fruitful results during the year. That Bureau furnished technical advice and leadership on rodent and predatory animal control, wildlife inventories and joint management of game ranges in Grazing districts.

RANGE MANAGEMENT

Encouraging progress was made during the past year in the development of sound range-management practices on the Federal range. Correction of former unsatisfactory and unwise practices coupled with the development of proper use practices featured the program in many

areas. Priorities having been determined and the rights of most applicants established under the law, problems of range management were given added attention.

The number of range users was increased by 1,267 and the total livestock grazed increased 898,322 over that of the preceding year. Part of this increase is due to additional areas being placed under administration. Certain prior withdrawals were lifted or placed under grazing administration through agreements. Such areas were then placed under controlled use. More accurate information on the actual use of all ranges became available.

While the number of users and of licensed livestock increased there were also many adjustments made resulting in reduction of numbers on overgrazed areas. Proper seasonal use in many areas made room for more livestock.

Sudden changes in customs and practices that have grown up over a long period of years are both impracticable and undesirable. Opportunity must be given the livestock operators to make financial and other adjustments on a practicable basis. The support that is being given to the Grazing Service by the stockmen themselves in the development of sound range-measurement practices is indicative of their acceptance of this principle. Wise counsel and assistance received from the district advisory boards contributed immeasurably to the furtherance of the range-management program.

The following tabulation provides the statistical detail of range use of the Federal ranges during the past year:

State	Number of districts	Number of licenses	Cattle	Horses	Sheep	Goats	Total livestock
Arizona.....	4	603	54,863	2,259	119,107	33,342	215,571
California.....	2	719	69,267	3,287	366,040	627	439,221
Colorado.....	5	1,878	162,239	5,540	951,969	116	1,119,864
Idaho.....	4	3,942	163,056	14,314	1,661,276	82	1,838,728
Montana.....	6	1,322	99,982	17,827	750,758	58	868,625
Nevada.....	5	1,978	269,543	13,954	1,081,113	1,846	1,366,456
New Mexico.....	6	1,881	250,462	12,295	529,022	64,240	856,019
Oregon.....	7	1,565	155,918	11,953	536,852	-----	704,723
Utah.....	9	5,178	192,335	10,442	2,618,918	28,720	2,850,415
Wyoming.....	5	1,543	155,357	14,497	1,501,267	221	1,671,342
Total.....	53	20,609	1,573,022	106,368	10,116,322	135,252	11,930,964

RANGE SURVEYS

Dependent property surveys.—The work on dependent property surveys continued during the year as an essential part of the program. Property surveys are needed to determine the extent to which applicants are entitled to share in the use of the range. A great deal of factual information has been gathered to expedite final apportionment of range privileges. These data are used also in

setting up a sound basis for the issuance of term permits in lieu of temporary licenses. Progress made in all of the regions indicates that term permits will be issued in many districts in 1941. Primary attention was given to areas where the demand for range was greater than the forage supply or where excessive use was occurring and expert information was needed to support administrative action.

Considerable cooperation in range survey work was obtained from other Federal agencies during the year, particularly in Nevada where cooperative survey projects have been under way during the past two years. These particular projects are designed to obtain factual information concerning soil, forage, economic, and related conditions in the area as a whole to promote sound range practices.

Range studies.—Range study work throughout the Federal range has not kept pace with progress in administrative work. Many problems need to be solved and the Grazing Service is working in selected areas to obtain a solution to many practical questions applicable to range management and livestock production. Stockmen are cooperating in these areas and a fund of valuable information has been obtained.

Carrying capacity surveys.—Surveys to establish safe limits of stocking the Federal range were continued but the limited funds available for this work handicapped desired progress to some extent. Thus, it was necessary to direct efforts in this field mainly to areas where overstocked or depleted ranges required immediate attention.

High lights of progress in the range surveys work are shown as follows:

Classification	Total completed to date	Size of job	Percent completed
Survey of public range.....	¹ 3, 815	¹ 12, 384	31
Dependent property surveys.....	² 11, 098	² 22, 895	44
Land status records.....	¹ 5, 449	¹ 13, 594	40
Base maps.....	³ 465	³ 590	79

¹ Townships (1 township equals 23,040 acres).

² Individual ranch units (vary widely in area and type).

³ State numbered base maps (covering 32 townships each).

Utilization studies.—The method of recording and interpreting range use by following a practical system of range utilization checks was extended over an aggregate area of about 20,000,000 acres in 39 of the 53 grazing districts during the year.

The method which was developed in the Grazing Service gives an index for making practical adjustments in range use when necessary. Factors which influence the degree of use that was made of a given area are weighed and a conclusion reached which assigns the area

either for future intensive study, for discontinuance of grazing, or for increased use as the case may be.

There is much to be learned about the productivity of the various soils on Federal ranges. Only fragmentary information is recorded concerning the usability of hundreds of plant species that grow on these ranges. It is a known fact that certain species withstand excessive use while others decline with only moderate use. The utilization checks are applied systematically over wide areas under a wide variety of conditions, designed to assist both livestock operators and administrative officers in determining the amount of use made of each vegetation species. The utilization checks have indicated clearly a need for better understanding of our forage resources. This type of work is conducted under the direction of the Grazing Service in cooperation with livestock operators who use the land under Federal licenses.

Stockmen have accepted this method of range appraisal and frequently supplement the studies by observations on their own allotments. They have learned the technique and appreciate the values to be obtained from wise range use.

Squaw Butte Range and Livestock Station.—Other important questions dealing with proper management of stock and range require more detailed consideration and study to insure results that can be properly evaluated. For the handling of such problems, the Grazing Service, in cooperation with the Oregon State College and an advisory council of stockmen, is utilizing the facilities available at its 16,000-acre Squaw Butte Range and Livestock Station in southeastern Oregon.

The Squaw Butte Range and Livestock Station, established in 1935, is an effective range laboratory used for working out practical problems of range management and animal husbandry applicable to approximately 40,000,000 acres in southeastern Oregon, northern California, northern Nevada, and western Idaho. In addition to the cooperation given by the Oregon State College and its extension service, valuable assistance was received from the Soil Conservation Service, the Bureau of Plant Industry, and the Bureau of Biological Survey on projects which relate to their respective activities.

FIRE PROTECTION

Protection of the range resources from destruction or damage by fire is a problem of increasing importance in Federal range administration. Insufficient attention has heretofore been paid to this important work, due largely to the absence of funds for the employment of personnel or purchase of equipment to control fires. Fires on the Federal range are due largely to human carelessness. Most range fires occur along

the principal highways and other routes of travel. Because of the character of the vegetation such fires spread usually with great rapidity and heavy damage results in a comparatively short period of time. The fire hazard is definitely increasing each year.

During the fiscal year 1940, C. C. C. enrollees from Grazing Service camps devoted 37,702 man-days to fire suppression and presuppression work on grazing district lands. This is an increase of 28,278 man-days used for a similar purpose the previous year.

During the fiscal year 1940 the fire hazard on many of the western ranges further increased and in some localities became very acute. Increased growth of vegetation, as a result of better management, naturally increased the amount of inflammable material on the ground as this vegetation matured. Generally the areas where the highest hazard exists are those reserved for fall and winter grazing. These areas represent a vital part of the feed required for year-long livestock operations in Federal range States. Fires cause loss of vegetation, increased operating costs and soil erosion and aggravate floods resulting in loss of soil and water.

The following table indicates the number of fires, causes, and acreage burned. No estimate has been made of the actual loss to the Government resulting from such fires, the concurrent loss to operators who would otherwise have used the range, nor the damage resulting from erosion.

Region	Class and number of fires			Causes								Total number of fires	Total area burned
	A	B	C	L	R	D	I	S	C	M	U		
Arizona.....			3							2	1	3	2, 202
Colorado.....	1	11	33	3	1		4	3	8	3	23	45	14, 233
Idaho.....	24	69	188	31	51		48	40	13	22	76	281	174, 701
Montana.....			9	3				2	1		3	9	5, 082
Nevada-California ¹				22	2		9	4	6		25	68	123, 278
New Mexico.....		1	4	2							3	5	528
Oregon.....	4	4	25	7	1		6	6	1	12		33	36, 486
Utah.....	1	8	14	2	2	2	1			5	11	23	25, 189
Wyoming.....		1	20	1		1	1	1		6	11	21	8, 177
Total.....	30	94	296	71	57	3	69	56	29	50		488	389, 876

¹ No record by classes.

Class A fires $\frac{1}{4}$ acre or less.

Class B fires between $\frac{1}{4}$ acre and 10 acres.

Class C fires over 10 acres.

L=Lightning.

R=Railroad.

D=Debris burning.

I=Incendiary.

S=Smokers.

C=Campers.

M=Miscellaneous.

U=Unknown.

The absence of any appropriation for fire-protection purposes was a very serious handicap, and it will continue to be until recognition is accorded in the way of an appropriation to handle this work. The lack of funds for fire control and suppression has been offset in part by the unusually fine cooperation extended to the Grazing Service by many persons and agencies in the range area. While this cooperation is thoroughly appreciated and has been very helpful, it does not and cannot take the place of the needed personnel, equipment, and funds in the Grazing organization. Many fires occur that cannot be reached by other agencies, or they may have fire problems of their own to contend with which prevent giving assistance to the Grazing Service.

Cooperation with the State and other Federal agencies administering Civilian Conservation Corps camps has helped materially. Instructions in the C. C. C. camps and other aid given by the Forest Service in fire-protection and suppression methods and in actual fire suppression have been extremely helpful. The establishment of State fire districts in several States conforming to the grazing district areas placed additional emphasis on the fire question and aided in the enforcement of fire laws.

The initiative of the Grazing Service personnel has been directed toward the development of ways and means of making the public more fire conscious and of practices and equipment suitable to fire control on the range areas. An interesting example of this work occurred in Idaho, where, through cooperation with the State Highway Commission, 129 large signs—Prevent Range Fires—were painted on the surface of State highways through areas of high fire hazard. This work is continuing as a part of the protection job for the summer of 1940.

WILDLIFE

Continued attention was given during the past year to the problem of providing for the needs of wildlife on the Federal range. There has been a noticeable increase in the interest that is being taken by everyone concerned in this very important feature of management of the western-range area. Individual stockmen and the advisory boards on which the wildlife interests are represented have shown commendable interest in making proper provision for the needs of wildlife. The interest thus shown by the stockmen is being met in an increasing number of cases by that shown by wildlife enthusiasts for the welfare of the livestock industry. There has been a meeting of minds in a great many cases which seems to indicate excellent possibilities for developing and working out a cooperative

program that will insure the handling of the wildlife resources on the Federal range in a systematic and orderly way. Past experiences with overpopulations of wildlife and resultant damage to wildlife and the range resources have been kept in mind, and studious attempts are being made to avoid repetitions of past errors.

State and other game officials having to do with wildlife matters in the several States are cooperating closely and effectively with the Grazing Service and the livestock interests in working out projects having to do with either game animals or game birds under the varying conditions existing on the range or which involve range use.

APPEALS AND HEARINGS

There has been a noticeable decrease in the number of appeals from Grazing Service decisions made to the Secretary of the Interior during the past year. Many of those that had arisen in the field during the year, as well as some that had not been heard from the previous year, were amicably adjusted. A planned effort was made during the year to settle prospective appeal cases right out on the range where a better and more complete understanding could be had as to the merits of the cases. This procedure has met with the approval of the stockmen who only turn to the legalistic procedure of appeals as a last resort.

Improved range conditions and the stabilization of the livestock industry being accomplished by the administration has had a tendency to increase the value of range privileges and thus, indirectly, to encourage attempts by poorly qualified or unqualified applicants to obtain recognition for grazing privileges. Complaints sometimes evolving into appeals from this source show some signs of increase, and, in any event, may be expected to continue more or less intermittently for a long time to come.

ENFORCEMENT

Owing largely to the desire of the livestock operators generally to cooperate with the administrative officers of the Grazing Service the number of willful violations of the provisions of the Act or of the Federal Range Code has been comparatively small during the last year.

Two arrests for livestock trespass were made in Utah and when brought to trial in the Federal Court, the defendants pleaded guilty, and, in addition to being fined, were required to make reasonable settlement for their unauthorized use of the public range.

In several cases of continuing trespass occurring in different States, where the livestock found in trespass had not been removed from the

public range after due notice and it was deemed inadvisable by the administrative officers to remove or impound them, relief was sought through proceedings in the Federal courts of the respective jurisdictions.

Actions were brought for the purpose of requiring the defendants to remove their stock, for the recovery of damages incident to the trespass, and to enjoin and restrain the defendants from further grazing their stock upon the public range without license or permit as provided by the rules and regulations of the Secretary of the Interior in force and effect in the several grazing districts in which the trespass occurred. The relief sought was granted by the courts in three cases—one in New Mexico, one in Arizona, and the other in Montana. In a fourth case, which occurred in New Mexico, and where the evidence disclosed that the trespass had terminated before the suit was brought, the proceedings to enjoin the trespass were dismissed, but the defendant was required to pay damages for the unlawful trespass, together with all lawful costs of the suit.

ADVISORY BOARDS

The advisory-board system, originated by the Department as a medium for local advice and cooperation, was made an integral part of grazing district administration during the year by amendment to the Taylor Grazing Act on July 14, 1939 (Public, 173, 76th Cong.). New elections were held during the year in all districts in accordance with an order approved by the Secretary of the Interior on September 18, 1939, amending paragraphs *a*, *c*, *d*, and *g* of section 12 of the Federal Range Code.

This order did not affect the prescribed functions and duties of district advisers under which they had operated since the inception of the code. In the past, however, there had been a tendency to underestimate their qualifications for assistance on problems of range management and thus full advantage was not taken of their knowledge and experience in this connection. To a large extent, therefore, the full inherent value of the advisory board system had not been clearly visualized. Nor was ample utilization made of their practical ideas of range management.

During the past year the advisory boards were brought more prominently into the planning end of administration. The many social and economic aspects of range use and management are well known to these men. Their long experience in particular localities is invaluable and their help in the shaping of plans and policies testifies to the reality of the range problems encountered. Steps were taken to utilize to the fullest extent possible this reservoir of knowledge and

experience in the perfection of plans for better land use and protection of the range.

The Federal Range Code, as adopted in 1938, was found to have certain imperfections. During the past year, therefore, a systematic effort was made to obtain from the 53 advisory boards recommendations for changes in the Code which would strengthen and simplify it and yet not upset any of the acceptable work done heretofore under the administrative program.

Meetings held for this purpose in all districts resulted in the presentation to the Director of practical recommendations for code changes. These recommendations were tabulated and made available for use by a special code-conference committee to meet with regional graziers and members of the Washington staff early in the fiscal year 1941. The code-conference committee was selected by the advisory boards of the respective regions and is composed of two board members from each region; 1 cattleman and 1 sheepman—18 in all.

The plan for this important conference recognized the fact that the members of the respective advisory boards are duly elected officials who represent all the users in the districts concerned. The selection of the code-conference committee from these advisory boards makes possible a continuity of representation directly from the individual stockman on the range to the conference room. Also it will help the Grazing Service to obtain a better picture of the variable physical, economic, and social conditions that exist in the several grazing districts, and should result in many worth-while changes in the code.

RANGE IMPROVEMENTS

The range improvement program kept pace with correlated activities on the range through a consolidation plan that took effect the previous year. This consolidation plan placed actual supervision, detailed planning, and execution of work projects directly under the regional graziers. Thus, in coordinating this work with range studies and range management the funds made available for range improvements under sections 10 and 11 of the Taylor Grazing Act were used with greater effect and efficiency than heretofore. For the most part these funds were used to purchase equipment and materials as well as for maintenance work on existing structures. The major part of labor required to construct new projects under these funds was performed by C. C. C. enrollees, thus enabling wise and efficient use of manpower and funds.

A field unit equipped to correlate engineering standards and to push the safety and job-training programs in C. C. C. camps was established during the year.

Water development to promote better range use continued as a prominent feature of the range improvement program in all grazing districts. There was a definite swing from "spot" planning to "overall" planning which resulted in projects of greater permanent value. More attention was given to range revegetation, flood irrigation, soil and water conservation, and range fencing while there was a noticeable drop in the number of truck trail projects.

MAINTENANCE

The problem of maintenance of existing range improvements was given careful analysis during the year. A survey was inaugurated to list and classify all completed projects to show present condition and usefulness, future need and probable cost of maintenance. This survey should yield an all-embracing maintenance program during the next fiscal year. To push this work there are being developed in each field region, portable trailer units that will be used by roving crews. Such crews can be detached as needed to "ride the range circuit" to repair truck trails, clean out reservoirs, replace troughs, repair spillways and fences, and guard equipment against sabotage.

RECORDS

The flow of reports was studied and a careful analysis made with a view to reducing paper work. As a result the regional offices were made offices of record for work programs thus reducing the clerical work to an absolute minimum consistent with requirements. Arrangements were completed and placed in operation during the year whereby the General Land Office acts as office of record for improvements on Federal range to safeguard the public interest on questions that rise on applications for homesteads under section 7 and for exchange under section 8 of the Taylor Grazing Act. Docket records of all projects will enable responsible officers to keep much closer check on progress of work and will facilitate the planning of future programs.

RANGE IMPROVEMENTS BY LICENSEES

Section 4 of the act provides that stock owners may be issued permits to construct and maintain fences, wells, reservoirs, et cetera, on public lands allotted to them to facilitate the handling of permitted livestock on the public range. The increasing number of such applications is clearly indicative of stability and confidence that pervade the livestock industry in Federal grazing districts. Significant is the fact that range improvements constructed and maintained under provisions of section 4 are willingly paid for by the livestock

operator. During the year 504 permits were issued in the grazing districts covering the following improvements:

Allotment boundary fence_miles_	2,073	Springs	6
Interior fence_miles_	849	Corrals	33
Water facilities	62	Shearing corrals	1
Earthen tanks	52	Lambing sheds	3
Wells	34	Rubble masonry dams	3
Wells and troughs	2	Pipeline	96,736 feet
Wells and windmills	42	Galvanized iron supply house	2
Windmills	3		

CIVILIAN CONSERVATION CORPS

In cooperation with the Civilian Conservation Corps, the Grazing Service advanced its program of useful range conservation work throughout the Federal range.

SAFETY AND EDUCATION

In addition special emphasis was given to training and orientation of enrollees to prepare them for useful citizenship. The C. C. C. program calls for conservation of America's youth as well as for conservation of natural resources. Accepting that challenge, the Grazing Service reexamined and organized its own talents and facilities in order to produce the best possible human results from the 15,000 young men entrusted to its custody. To meet more fully this responsibility a safety and training unit was established in the field during the fiscal year. This unit was staffed with a complement of safety engineer inspectors who visited and revisited the camps and projects to render advice, correlate job-training and camp educational work and assist in healthy orientation of boys in their new environment.

The educational plan was not confined to enrollees. Camp life to be successful must have competent leadership. Project foremen and camp superintendents must have ability to conduct the work program as well as aptitude for leadership and group training. For this reason attention was directed toward leadership in camps through training schedules and written instructions.

Safety bulletin boards on which are posted current records of accident-free days were erected in each camp. Four camps with an average complement of 170 enrollees were operated the entire year without a lost-time accident.

TRAINING

C. C. C. enrollees receive job-training of wide variety and usefulness. Many of the boys become proficient with tools and machinery. Others excel in mechanical drawing or drafting. The varied types of work performed in Grazing Service camps has led

directly to many jobs in private industry. Thirty-one enrollees were honorably discharged from one camp during the year to accept gainful employment, 10 as mechanics, 15 as truck drivers, 1 as sign painter, 1 as cook, 1 as metal buffer, and 3 as salesmen, at salaries ranging from \$80 to \$150 a month. Reports from other camps indicate an average of 20 boys a camp were honorably discharged during the year to accept private employment. In one instance the salary was \$240 a month.

In addition to private employment many enrollees advanced in the Grazing Service organization itself and some went to other Federal agencies. On June 30, 1940, the Grazing Service pay roll listed 82 former enrollees who had been promoted to clerical, technical, nontechnical, and supervisory positions.

Provision was made during the year to give each qualified enrollee a Certificate of Proficiency signed by the Director of Grazing, the camp superintendent, the camp commander, the camp educational adviser and the regional grazier. Such a certificate is a recommendation of the boy's character and his skill in a particular type of work.

COMMUNICATION

The problem of communication between regional offices and main camp and between main camps, side camps, roving maintenance crews, and fire fighting crews was carefully studied. As a result of this study a network of radio communication was installed in several regions. Instruments used are small, portable audio-radio units. Through the cooperation of the Interdepartmental Radio Advisory Committee, the Grazing Service was assigned a frequency for emergency calls. The service records all messages handled and accounts for all time on the air. During the year a plan was set up to train enrollee radio operators, and to extend the system into all of the 10 Western States during 1941.

ACCOMPLISHMENTS

The Service operated 89 camps during the year distributed in the 9 grazing regions primarily on the basis of public-domain acreage and the acute need for range rehabilitation as follows:

State	Number districts	Acres public land	Camps	State	Number districts	Acres public land	Camps
Arizona.....	4	9, 651, 778	5	Nevada.....	5	34, 599, 978	17
California.....	2	4, 053, 294	2	New Mexico.....	6	15, 346, 655	10
Colorado.....	5	7, 100, 755	8	Oregon.....	7	11, 978, 370	9
Idaho.....	4	11, 819, 933	10	Utah.....	9	26, 687, 719	14
Montana.....	6	5, 914, 384	5	Wyoming.....	5	13, 697, 034	9

The major part of the improvement program includes work on scheduled projects. However, each month in every camp, enrollees respond to emergency calls. They fight range fires, clear snow-blocked roads, and perform numerous acts to relieve human suffering. In Wyoming, a crew of boys was returning to the base camp at the end of the day. They saw an overturned automobile at the roadside, investigated and found a man pinned inside the car. Bringing their first-aid training into play, they made a tourniquet, bandaged the man's wounds, and rushed him to the hospital. The physician told them that their action saved the man's life.

Work projects have been divided into two major classifications:

(1) Projects to aid range management and facilitate range use.

(2) Projects to protect the soil and improve the range itself.

Major accomplishments in these two classifications are summarized in the following tabulations:

RANGE MANAGEMENT, RANGE DEVELOPMENT, AND RELATED PROJECTS

Project	Unit	Accomplishments, fiscal year 1940	Total ¹
Springs.....	Number.....	219	603
Reservoirs.....	Number.....	76	269
Wells.....	Number.....	35	183
Fences.....	Miles.....	1,261.0	3,415.9
Cattle guards.....	Number.....	132	392
Corrals.....	Number.....	48	274
Bridges.....	Number.....	55	241
Truck trails.....	Miles.....	1,760.5	6,986.6
Stock trails.....	Miles.....	190.1	2,148.4

SOIL PROTECTIVE AND RANGE PRODUCTIVE PROJECTS

Permanent check dams.....	Number.....	551	6,320
Temporary check dams.....	Number.....	308	47,425
Water control structures other than dams.....	Number.....	5	277
Impounding and large diversion dams.....	Number.....	166	867
Rodent control.....	Acres.....	1,904,510	9,856,608
Insect pest control.....	Acres.....	27,821	135,984
Range revegetation.....	Acres.....	148,026	180,015
Tree planting gully.....	Square yards.....	320	6,800
Diversion ditches.....	Linear feet.....	98,985	499,031
Channel construction.....	Linear feet.....	300	12,041
Water spreaders.....	Linear feet.....	51,094	106,218
Clearing and cleaning channels.....	Square yards.....	35,560	47,245
Pipe and tile conduits.....	Linear feet.....	52,476	234,124
Riprap or paving.....	Square yards.....	11,950	317,415
Fire fighting.....	Man-days.....	37,702	72,485

¹ Includes fiscal years 1935 through 1940.

OFFICE OF INDIAN AFFAIRS

John Collier, Commissioner

DEMOCRACY today in peace and war is locked with anti-democratic forms in a world-wide struggle.

America's Indians within the hemisphere, and within the United States, have waged a very comparable struggle for many lifetimes. In the United States now, at last, they are winning. Their victory, as yet incomplete, is important to our own country and important in the hemisphere effort at democratic defense which has now begun.

Against the background of the greater struggle, the Indian program has been carried forward during the past fiscal year, and a review of the progress of that short period has, to be significant, to cover a 20-year period, against a much longer background. This review has also to look beyond the frontiers of the United States, to the south, to those parts of the Western Hemisphere in which the emerging 30,000,000 Indians may play a decisive role in the struggle for the maintenance of democratic institutions.

The Indians of the United States are a population about as numerous as the city of Seattle, Washington. Numerically they are about one-seventieth of the Indians of the North, South, and Central Americas. Why is it that a minority so small in number should continue to be important in the eyes of 130,000,000 Americans, and of this mighty Government?

* * * * *

The Indians are a Mongoloid stock, which migrated probably from many regions of Asia, at intervals of thousands of years, commencing perhaps 18,000 years ago. The Indians, as early probably as 8000 B. C., had found their way eastward to the whole Atlantic border of North America, and southward across the huge deserts and mountain ranges and the tropical jungles, down to Patagonia in South America. These stocks proved to possess the highest capacity for adaptation, and a tendency toward rapid social evolution, while at the same time they displayed marked tenacity in holding to ancient types—physical, social, and psychological. At the Hemisphere Congress of the Indians, the first ever held under the auspices of 21 American governments, at Patzcuaro, Mexico, in April 1940, all the Indians and all the governments were in agreement that they—the



INDIANS SERVE THE NATION.

Educational advancement enables the Indians to share the responsibility of national defense and civil administration. Upper: Members of the Comanche, Cherokee, and Cheyenne tribes take an advanced course in Diesel motor technique. Lower: Girls from many tribes are employed in the Office of Indian Affairs in Washington.



NATIVE CULTURE PRESERVED.

Age-old beauty of design and workmanship are combined in the handicraft of this Indian silversmith, the authenticity of whose native jewelry is safeguarded under the program of the Office of Indian Affairs.

Indians in all the countries—are a highly individualized resource and problem; that elements of Indian life are, for sociological purposes, interchangeable from country to country, and from continent to continent; also that the Indian has demonstrated in the four centuries since Columbus, a capacity for every technological and social adaptation for which the rapidly changing European-influenced world has called.

Few are the Indians in the United States; and yet at that hemisphere meeting, the scrutiny of Indians and governments was focused upon the historical record and the present Indian program of the United States. For in this record was contained the equivalent of nearly all that was bad in the Indian record of all of the American countries, and there was contained nearly all that the countries south of the Rio Grande once believed they had to fear at the hands of the United States. But in the new Indian program of the United States as cumulatively made effective across the last 12 or more years, there was exhibited nearly all that the Indians of the southern countries could hope for. This new program emphasized the changed attitude on the part of the United States toward a minority of a different culture and blood, a reassurance to the neighboring countries to the south that in it was provided one of the needed foundations for hemisphere cooperation in defense of democracy.

The Indian policies of the United States from 1870 onward were essentially dictatorial toward the tribes and repressive toward the local democracy of the Indians. But several generations of repression in the United States were not effectual in destroying the local democracy of the Indians, or even in fundamentally modifying the Indian types and Indian institutions of local democracy.

At the Inter-American Indian meeting at Patzcuaro, where the diplomats of all the countries were gathered, and in addition the Indian welfare workers of most of the countries, and Indians from half the countries, declarations were enacted unanimously to the effect that the local democracies of the Indians should be regarded as fundamental within the polity, economy, and cultural effort of all the nations of the West. And the two countries which have proclaimed the efficacy of the local democracy of Indians, and have provided for this local democracy a place in the framework of national effort, were accepted as the torchbearers and leaders in behalf of the 30,000,000 Indians and of the twenty countries having Indian populations.

Universally, Indian local democracy is profoundly involved with the possession and the cooperative utilization of natural resources.

Not primarily by the slaughter of Indian caciques, priests, medicine men, orators, and artists, did the Spanish and the Portuguese dominance drive Indian democracy underground, but rather by the separation of the Indian from his land.

And in the United States, the blows struck at the local democracy of the Indian tribes were only in their minor part a repression by the military, and later the civil arm, a banning of Indian languages, Indian tribal organizations, Indian religions, and Indian family life. Here in the United States, as in the Southern countries, the major blow was struck through the destruction of the Indian land estate; and here, that destruction did its most fatal work through the system of forced land allotment, commencing as a universal basic policy 53 years ago.

But how different today is the outlook from that which prevailed in Mexico 35 years ago, and in the United States 20 years ago. Then, Indian democracy seemed to have been reduced to a mere legend, a ghostly sentiment in the minds of Indians and of admirers of Indians. And with the apparent death of Indian democracy, had died, it seemed, Indian culture, Indian energy, Indian group capacity, Indian citizenship, and the spirit of the Indian. The Indian, whatever his biological future might be, appeared to have no Indian spiritual future. And in the United States, his biological future seemed to be that of a rather early extinction.

Without referring further to the countries outside the United States, let us view what has happened within the United States. The progress of Indians toward economic independence has been gratifying, but there are many problems which they and the Indian Service cooperatively must yet solve. A few of these are suggested in this report. The development of an indigenous leadership capable of helping Indian groups to adjust their social organization to the increased demands of a changed civilization is a task only partially solved. The acquiring of a land base adequate for the most meagre subsistence economy for all Indians will require larger and continuing appropriations. The volume of lands in heirship status is increasing. More funds for the purchase of these lands are needed in addition to more trained personnel to carry on programs of land consolidation. Erosion of range lands continues in areas where already the resources are inadequate for livelihood. Extensive irrigation developments and much resettlement must take place to relieve the pressure in these areas.

In spite of these major unsolved problems the future of the American Indian is brighter today than at any time during the past hundred years.

TWO DECADES IN REVIEW

Nineteen Twenty in Indian history was not a year distinguished by any new developments or important official actions. This year is chosen as a datum point because it just preceded a more menacing time, and because out of that menace there was born in the Indian a strengthened will to live and that strengthened will has now conquered. The Indians, as of 1920, were admired for their extraordinary record as volunteers in the World War. The first signs of a renaissance of Indian art had begun to appear among the Pueblo tribes of New Mexico.

The cumulated and inherited official policy in 1920 was moving ahead impersonally and with a ruthless benevolence or a benevolent ruthlessness. That policy was one of extinguishing the Indianhood of all Indians through all devices within the control of a government whose power over Indians was absolute; it included a continuing expropriation of the Indian land.

Since 1887, when the General Allotment Act had been passed, approximately eighty million acres of the best land owned by Indians had passed to whites. A little more than fifty million acres of poor land, half of it desert or semidesert, remained in Indian possession; but the good residue of this land, in all but a few limited areas, was being used by whites on the lease system. The Indians were not organized, capitalized or individually trained to use their own land. The proceeds of the leases went to the support of the Indian Bureau and, as a trickle of yearly revenue usually insufficient for livelihood, to Indians in allotted areas.

The movement to break up the Pueblo Indian tribes, to bestow their lands upon the whites, and to deny the Indian title or equity in Executive order reservations (more than half of the residual Indian lands) was gathering rapid headway in 1920.

The Indian death rate was slowly but implacably rising, and it continued to rise until about 1928 when it approached the birth rate.

Indian poverty, by and large, had become the most extreme that could be observed among any part of the population in the United States.

And everywhere, excepting in certain limited parts of the Southwest, the tribal and the individual life of Indians was managed through a centralized and a horizontal bureaucratic program, under the aegis of thousands of uncoded statutes and of more than ten thousand pages of unassembled regulations, by an Indian Bureau which monopolized all the power over Indians and all the Indian Service.

The situation of 1920 was no matter of swift external disaster, such as flood, drought, or war. The condition of the Indian in 1920

had developed cumulatively across five generations. Only by knowing how deeply down the Indian had been pushed and how long held in suffocation, how long told that he had to die, can anyone evaluate the intensities of rebound which have gone forward in recent years.

Moving rapidly up the years from 1920, we witness first the defeat, in 1922-23, of the official attempt to disperse the Pueblos. We witnessed the enactment of legislation to revest the Pueblos with land. That legislation was passed in 1924. We witness the enactment, in 1926, of legislation placing Executive order reservations upon a parity with treaty reservations, thus vetoing the official plan of 1923 to transfer more than half of the then Indian estate to whites. We witnessed in 1926 the invoking of the help of the United States Public Health Service in an effort to check the rising death rates of the tribes. We see the Indians organizing the council of all the New Mexico Pueblos, a still-continuing active organization, the first example of this Indian political renaissance. In 1924, expressly in recognition of their World War services, full citizenship was voted to all Indians by Congress. In 1927, for the first time, we see an action by the Department of the Interior to bring the light of social science to bear upon the Indian need and upon its Indian Bureau's operations. The monumental study by the Institute for Government Research, known as the Meriam Survey, resulted from the initiative of the then Secretary of the Interior. In 1928, the Senate moved into action, and the hearings and documents of the special committee upon Indian investigations of that body totaled 36 printed volumes by 1939.

With the year 1929, an intellectual revolution was in full swing within the official Indian Bureau. The schooling policies of the Indian Office were fundamentally modified starting with that year. The movement was from uniformity of curriculum to diversity, and from mere classroom activity to community schools.

In 1929 the Secretary of the Interior and the Commissioner of Indian Affairs joined in memorials to Congress, asking for legislation to reestablish the local democracy of Indians, to curtail the absolutism of the Government's Indian system, to apply the concept of constitutional right to Indian economic affairs, and to settle decently and promptly the host of Indian tribal claims growing out of breached treaties and compacts of the past years.

And of inconspicuous but of basic importance was an effort, beginning in 1929, to apply modern principles of personnel work in the Indian Service. That effort is not yet finished.

Public opinion could not move all at once; neither could Indian opinion, nor administrative or congressional thinking. Active, con-

tinuous attention by the Chief Executive was needed; and in 1933, at last, the needed assembled data and administrative trends were available to President Roosevelt. And 1933 and the ensuing years were a time of change within the Government. In general, that change moved toward goals which naturally included the Indian goals of democracy and of the cherishing of the land. So it was without public shock that in 1933 by secretarial order the sale of Indian lands to whites was stopped. Without public shock, the Indian cultures and religions were put in possession of the full constitutional guaranties. Without public shock, the institutionalized boarding schools for Indians were cut by one third and the children were moved to community day schools, and thousands of children never schooled before were brought into the classroom.

Then the Indian Reorganization Act was formulated. The administrators took this proposed reform legislation to the Indians in great regional meetings and through the Indians assembled there, back to all of the Indian communities. For the first time in history, all Indians were drawn into a discussion of universal problems of the Indians, and these universal problems focused upon the most ancient and most central Indian institution, local democracy integrated with the land.

Congress passed the Indian Reorganization Act in 1934, and it incorporated in this act a feature new in Federal legislation, the referendum. The act, as passed by the Congress and signed by the President, was by its own terms merely permissive. Every Indian tribe might adopt it or reject it by majority vote by secret ballot.

The structural features of the Indian Reorganization Act are as follows:

- (1) It prohibits the further individual allotment of lands now owned by the tribes, or to be acquired for the tribes.
- (2) It returns to tribal use lands withdrawn for homestead purposes but not settled.
- (3) It authorizes an annual appropriation of funds for land purchase.
- (4) It makes mandatory the practice of conservation in the administration of Indian lands.
- (5) It establishes a revolving credit fund out of which loans may be made to the tribe and the individual for productive farming and industrial operations.
- (6) It encourages the organization and incorporation of the tribes for self-government and self-management of economic resources.
- (7) It provides funds out of which loans may be made to Indian students seeking higher academic or vocational education.
- (8) It gives Indians a preference basis under Civil Service rules for employment in the Indian Service.

The Indian Reorganization Act, under which today 74 percent of the Indians are living and functioning, does not contain the whole of the present Indian program. There are tribes not under the act which are realizing a creative self-determination not less than tribes that are under the act. And there are many tribes, under the act by their own choice, which have chosen to go forward with their ancient and never-extinguished types of local democracy, rather than to adopt the parliamentary type of self-government.

The developments of Indian health are not within the orbit of the Indian Reorganization Act. Improved and expanded clinical and preventive work, reinforced by better food for Indians and by a new spirit of hope for Indians, have reversed the life-tide of the Indian race. A death rate of 27 per thousand in 1928 has fallen to a death rate of 14 per thousand in 1939. Even the death rate is an imperfect index. Trachoma does not kill, but blinds. The Indian medical service, through its research work in 1936, demonstrated for the first time the communicability of trachoma through a nonfilterable virus, and now through sulfanilamide therapy is eliminating trachoma in whole blocks of Indian country. The trachoma incidence at its peak was 20 percent or more within certain tribes.

Again, the Indian Reorganization Act hardly hints at the developments in the schooling system, for Indians across recent years or in the Indian C. C. C., Indian rehabilitation, and the adult education of Indians.

No mention of Indian arts and crafts is contained in the Indian Reorganization Act. The almost bewildering efflorescence of the Indian arts and crafts is a growth of 20 years, but really it is a rebirth of influences, of conventions, and of genius thousands of years old. The Indian Arts and Crafts Board was instituted in 1935, subsequent to the passage of the Indian Reorganization Act.

The Indian Reorganization Act conveys no suggestion of the changed policies which have stripped the Office of Indian Affairs of its monopoly over Indian services. These services are now diffused among many Federal agencies, and through contract under the Johnson-O'Malley Act, among State and local agencies. The concentrated attention to Indian need and Indian potencies is still the responsibility of the Office, as is the more intensive portion of the Indian educational effort and 90 percent of the Indian health effort. But the Indian Service is no longer a separatist institution, but a crossways of the work of many Federal agencies, State and local subdivisions, and above all, of Indian groups performing and seeking their own services.

And the Indian Reorganization Act gives no more than a hint of that phase of Indian life which possibly is most basic of all. Repeat-

edly it has been stated above that the Indian institution is local democracy, but local democracy integrated with the land. Always in pre-history, this unity of the Indian with his land was a unity of use, of conservative use, of planned use, and of use in the spirit of reverence and even within the aura of mystical religious sanctions.

It was not the mere fewness of the Indians which delivered the territory of the United States to the white man perfectly conserved—primal in its water, soil, herbage, and fauna. There are areas of the United States with a population little or no denser than the Indian populations of pre-Columbian time, where white men have wrecked in a few years portions of the earth which the Indians had conserved through eons.

Under Indian Bureau control, in the years prior to 1933, through overgrazing and unplanned use, even the lands owned by Indians had been damaged and in many instances had been gutted.

The year 1933 witnessed a rising Indian population upon a land base quantitatively very insufficient and qualitatively critically deteriorated. The Navajo range was two-thirds wrecked. The Acoma and Laguna ranges were more than two-thirds wrecked. Through the whole of the West, the Indian ranges were down as low as the average of the western range, which was more than 50 percent down. Eroding Indian lands were threatening to shorten the life term of great reservoirs like the Elephant Butte and Lake Mead. Eroding Indian lands had contributed to the water-logging and the economic ruin of the middle Rio Grande Valley.

Certainly the most dramatic and nationally important phase of the Indian record across the last seven years has been the Indians' own effort at conserving their lands. No groups in the country have made voluntary sacrifices comparable to those self-imposed by tribes such as the Navajo, many of the Pueblo, the Hopi, and others which could be mentioned. These Indians have willed above all that the Indian spirit—the Indian being—should live on, and hence they have willed that their land should live on, their land being a part of their spirit.

Tribes the most archaic in their social forms, such as Acoma Pueblo, have become the advance guards in the adoption and use of modern technologies of land conservation, range management, animal husbandry, and marketing.

Tribes supposedly apathetic if not sullenly resentful, such as the Apache (and this means all of the Apache tribes) have stepped to the forefront as conservators, creators of great cattle herds which do not overgraze, and operators of cooperative enterprises of the most modern types. And in their political self-government these

tribes have become models, deserving study by the white counties or States.

The conservation of water, soil, herbage, and fauna is of national importance, if the economy of the United States is to survive at all. It is of importance almost as pressing in time as military preparation. Here the Indians have shown the way, and even from the quantitative standpoint, what they are doing is of decisive importance to the Boulder Dam, to the whole life of the Rio Grande watershed, and to critical areas of the Great Plains.

But there is something else, more important even than the conservation of the earth and its soil, plants, and animals. That is the conservation of the human spirit through the institution of democracy. The great unanswered question hangs over all free peoples: Can we meet the totalitarian competition, while being more and more, not less and less, free?

The impressive material achievement of the Indian across recent years has been attained through the revival of ancient forms, and the establishment of very modern forms, and the merging of ancient and modern forms, in local democracy. The Indians have proved that democracy can plan and can execute. They have proved that democracy can impose sacrifices on itself. They have proved that democracy can be as powerful in its motivation as the racisms, the economic-mystic ideologies, or the atavistic propagandas of some of the totalitarian countries.

And in this same connection of local democracy, the Indians of the United States have held high a signal to the 30,000,000 Indians of the South and Central American countries, who are in many of these countries the dominant population.

INDIAN POPULATION

Indian population is increasing at the rate of about 1 percent per year as compared with 0.7 percent per year for the general population.

The number of Indians reported under the jurisdiction of the Federal Government on January 1, 1940, was 361,816, indicating an increase of 9,938 over 1939. This figure represents only in part a natural increase, however, as the estimate of the population of the Five Civilized Tribes in Oklahoma has been revised based on agencies reported in Oklahoma from 1930 to 1940.

Organized groups, such as the Chippewa in Michigan and Wisconsin, recently enrolled under the Federal Government's jurisdiction, account in part for the large increase from 327,950 Indians reported April 1, 1934, as compared with 361,816 in 1940.

As the Bureau of the Census figures on Indian population will be available within the next year, it should be pointed out that the figures of the Census Bureau will probably not be identical with the figures reported here due to differences in methods of reporting used by the two agencies. The Indian Service population figures are based on the number of Indians enrolled under Federal jurisdiction, whereas the figures of the Census Bureau are based on residence. Also difference of opinion as to the definition of an Indian constitutes a source of disagreement.

Indian Population Under Jurisdiction of Office of Indian Affairs—Apr. 1, 1934, and Jan. 1, 1940

State	Jan. 1, 1940	Apr. 1, 1934	State	Jan. 1, 1940	Apr. 1, 1934
Total.....	¹ 361,816	327,958	Nebraska.....	4,562	4,498
Arizona.....	¹ 50,539	44,093	Nevada.....	5,455	5,076
California.....	23,281	23,808	New Mexico.....	37,517	34,726
Colorado.....	882	834	New York.....	¹ 6,861	4,523
Florida.....	586	580	North Carolina.....	3,472	3,254
Idaho.....	4,281	4,187	North Dakota.....	11,692	10,287
Iowa.....	473	419	Oklahoma.....	¹ 103,200	94,980
Kansas.....	2,108	1,860	Oregon.....	¹ 5,339	4,644
Louisiana.....	115	-----	South Dakota.....	¹ 28,695	26,695
Michigan.....	¹ 4,704	1,192	Texas.....	344	250
Minnesota.....	16,414	15,200	Utah.....	¹ 2,224	2,124
Mississippi.....	2,025	1,792	Washington.....	¹ 14,103	13,418
Montana.....	16,840	15,255	Wisconsin.....	¹ 13,678	12,085
			Wyoming.....	2,426	2,178

¹ Estimated in part.

TRIBAL SELF-GOVERNMENT

Since 1935 the Indian tribes of the United States have been exploring anew the methods of democracy. In a world in which democracy has been yielding to increasingly effective attack, these efforts of Indian tribes have more than a passing interest.

Indian tribal government derives its basic sanction from the legal doctrine that the Indian tribes were once sovereign nations, and are still domestic, dependent states, capable of exercising any powers of self-rule not specifically taken from them by treaty or by act of Congress. "A weak state, in order to provide for its safety, may place itself under the protection of one more powerful, without stripping itself of the right of government and ceasing to be a state," wrote Chief Justice John Marshall in 1832, and the doctrine has been followed by the courts since then.

In 1934, disturbed by abundant evidence that Indian affairs had grown desperate, that Indian lives were endangered by poverty and disease, and that Indian property was approaching the vanishing point, Congress adopted the Indian Reorganization Act, which declared that the administration of Indian affairs should square itself

with the doctrine laid down by John Marshall. Each tribe should have the right to exercise all its inherent powers—the right to adopt a constitution, the power to operate its own machinery of government, to determine rights of membership (citizenship in the tribe), to regulate domestic relations within the tribe, to levy taxes upon members, to regulate tribal property, including the right to prescribe rules of inheritance, and to administer law and order within the tribal jurisdiction. The possibilities are unlimited. The way is open for an Indian tribe to assume a political and economic control over its internal affairs, as complete as that of any incorporated municipality.

The tribes were not forced to assume these responsibilities. They could reject the law itself if they chose; that was the first application of the democratic process. During the period 1934–36, 266 elections were held. (The Oklahoma and Alaska Indians were not concerned in these elections, as they were brought under the law by subsequent legislation.) In this balloting, 189 tribes (representing 129,750 Indians) voted to accept the law, and 77 tribes (86,365 Indians) rejected it. The elections were by secret ballot, and upward of 60 percent of the electorate participated. The first tribal constitution was formally adopted by tribal vote in October 1935. Since then 135 tribal constitutions have been written, voted upon, and put into operation by the Indians of the United States and Alaska—a venture in constitution-making on a scale which must be unique in history.

Incorporation follows upon political organization, if the tribe wishes to take this further step. As a chartered corporation the tribe assumes additional control of its affairs and further responsibilities. At this time a total of 105 Indian groups in the United States and Alaska have ratified such charters.

The type of organization adopted by the tribe reflects, again, the Indian will. Self-government among Indians, if effective, will follow no set pattern, since the patterns of Indian life are as numerous as the tribes. Some of the most effective native governments, in terms of maintaining social control within the group, are the archaic forms which existed before the first Europeans reached American soil and which have survived the impact of the white race. But whether the tribal government is an ancient one or a twentieth-century product, membership in the governing body, tenure of office, control of procedure, are wholly within Indian hands.

The activities of the organized Indian tribes are varied and are increasing greatly in volume as the Indians become familiar with their opportunities. They adopt law-and-order codes as a means of bringing within the scope of tribal action matters which in former years

were administered by the reservation superintendent and his staff. They enact land-management laws and in some cases are daring to break-up old patterns of land use to provide for the young and landless members of the tribe. They are overhauling their membership rolls and, to an increasing extent, insisting that membership shall be based on an active relationship and not a vested interest in possible financial returns. They are developing systems of taxation and disbursement (budget-making), controlling hunting and fishing on the reservation, leasing tribal lands and entering into business contracts of various types, protecting public safety and morals—assuming, in short, the powers of self-government, powers which in many cases the Federal Government had exercised for them in the past.

How is the Indian meeting the challenge of democracy?

On the Western Shoshone Reservation (in Idaho and Nevada) the tribal council has recently instituted an experiment in its jury system. It has set up a permanent panel of 15 jurymen, to which any party to a suit in the tribal court may appeal from the decision of the court. Drawings from the panel of 15 are made until 3 jurymen acceptable to both parties have been found. The decision of the jurymen is final. This provision for appeals is particularly significant in view of the fact that State courts have no jurisdiction in Indian matters and Federal courts have jurisdiction only in certain major crimes, 10 in number. In ordinary cases, therefore, there is no appeal from the decision of the tribal court.

Every tribal constitution has granted women full political equality. Since the beginning of tribal organization numerous women have served as members of tribal councils. The Eskimo Community at Nome, Alaska, just organized, has elected a council of five, of which four members, including the president, are women.

At Fort Belknap Reservation in Montana a mission school has organized one of its advanced classes under a constitution adapted from the constitution of the Fort Belknap Reservation. The students in this class carry on exactly as would the adult meeting; and, in fact, members of the adult council attend the student council, and the visits are returned by the students. The students have worked out a program for the utilization of the reservation resources, strikingly comparable to that developed by the older members of the tribe.

During the spring and early summer of the present calendar year a series of schools were held in several sections of the Indian country for the benefit of members of the tribal councils. The positive result of these schools was the indication that during these 5 years a wholly new attitude has been growing up among the Indian tribes. Self-government has become a thing of meaning.

Progress, admittedly, has not been even. To deny the failures and shortcomings of these 5 years would be to claim too much for the democratic principle; it does not remake men overnight, it does not endow them with superwisdom and supertolerance. At its best it seeks only to remove from men's minds the fear of authoritarian control, to leave each man free to develop his own powers, and to fulfill his responsibility to society. A democratic state is not created overnight, by fiat; it is arrived at slowly and painfully, a product of the deepest aspirations of the men and women making the state.

Naturally, Indian democracy is not yet perfect. In the area of law and order, for example, tribes which have taken over the responsibility of policing themselves and administering justice have gone astray at times and permitted factional interests and personal quarrels to intrude. Again, in the matter of handling finances some tribal officials have shown a lack of civic honesty which is strikingly similar to official conduct occasionally found in other places. These failings have brought demands that the Indian Reorganization Act itself be scrapped, that Indian matters be restored to the absolutism of departmental regulations. Land assignments have not always been granted on the basis of merit; sometimes favoritism has entered into the actions of the governing bodies. A number of ill-considered actions have resulted from a failure to understand the proper scope of tribal authority and the mechanics of tribal constitutions.

But not one of the failings of all these years has resulted from moral viciousness or from intellectual incapacity. Never has there been any question of the ability of the Indian people to rule themselves and to rule more wisely than benevolent absentee authority could. The failings do demonstrate, however, that the Indian Office in the years ahead can be particularly helpful by working with the tribal governing bodies and encouraging them to make full and wise use of their powers and to develop habits of thinking in terms of tribal welfare. The future of the Indians is the stake in this matter.

LAND

The future of the Indian depends upon the fate of his land. From the day of the white man's arrival in the New World, continuously, inexorably, year after year, Indian lands passed from Indian to white ownership. In war and peace, under administrations of every political hue, the loss of land to Indians continued.

By 1886—110 years after the Declaration of Independence—conquest, treaty, and private purchases had whittled the Indian lands to a total of 140,000,000 acres, which were scattered through almost

200 reservations, mostly beyond the Mississippi. But the voracious land hunger of the growing nation had not yet been satiated. The Indian tribes still had land considered ripe for exploitation. Public opinion, however, would no longer condone dispossession at the point of the gun. The same result, nevertheless, was achieved legally by applying the principles of the Homestead Act to Indian reservations. Tribal lands were subdivided. Each Indian was allotted an individual tract of land and the surplus "land not then required for allotment to enrolled Indians" was opened to white settlement. The individualization of Indian tribal property was authorized by the General Allotment Act of 1887 and by similar special acts. It proceeded apace for 40 years, slowed down in 1928, and terminated in 1933. But the damage done to the Indian estate will require generations to repair.

Through the sale of "surplus" tribal lands, of patented allotments, and of land in heirship status, the cruel process of alienation continued. The majority of the Indian tribes subjected to the allotment process objected vigorously, but without avail. With the shrinkage of their land base the Indians' economy, spirit, and local democracy crumbled.

LAND LOSSES CEASE

The loss of land came to an abrupt end on August 14, 1933, when Secretary of the Interior Ickes approved an order of the Commissioner of Indian Affairs prohibiting the sale of Indian allotments and heirship lands except under special circumstances. A year later, by the Indian Reorganization Act, Congress prohibited future allotments of Indian tribal land for all tribes which accepted that act, authorized the restoration to tribal ownership of Indian "surplus" lands which had been opened to entry, and authorized an annual appropriation of \$2,000,000 for the purchase of land for Indians. After four centuries of continuous shrinkage, the Indian landed estate was at long last beginning to expand again.

Between 1880 and 1930 the Indian land loss had averaged 2,000,000 acres a year. In 1934 the Land Committee of the National Resources Board estimated the immediate urgent needs of the Indians for agricultural, timber, and grazing land to be 9,706,000 acres, approximately one-tenth the acreage the Indians had given up during the preceding 50 years. It was also estimated that complete rehabilitation of the Indian tribes on sufficient land which, effectively and conservatively used, would enable them to be self-supporting on a reasonably adequate standard of living, would require another 15,000,000 acres. The completion of this Indian-land program would still leave the Indians with 60,000,000 acres less than they had in 1887.

To carry out the Indian land-acquisition program, Congress between 1936 and 1940 appropriated a total of \$4,425,000. To June 30, 1940, a total of 270,637 acres had been acquired with this fund, with an additional 30,000 acres under option. By restoration to several tribes, 760,000 acres of Indian lands opened to entry had been again made available for Indian use in the same period. The restoration of another million acres is contemplated. By the purchase of submarginal land with emergency funds 902,900 acres were added. Of the public domain about 1,368,000 acres were added to Indian reservations or set aside for Indian use by Congress, and the use of more than 610,000 acres accrued to Indians under the provisions of the Taylor Grazing Act.

TRIBES BUY BACK THEIR LANDS

During the last 3 years several of the Indian tribes have at last seen the wisdom of investing parts of their tribal funds in the re-acquisition of land from the sale of which these tribal funds were derived. Thirteen tribes in 10 States have authorized the use of \$1,647,225 for this constructive purpose, and the purchase of 34,853 acres costing nearly a quarter million dollars was completed by June 30, 1940. Since 1934 the Navajo Tribe has hypothecated its tribal revenue to the extent of \$500,000 for the purchase of 324,000 acres in Arizona and Utah within the boundaries of its reservation. The Navajos are seeking to purchase a similar amount of badly needed grazing land in New Mexico.

From all sources the increase in the amount of land made available for Indian use since 1933 has reached a total of about 4,260,000 acres. Yet this acreage is only a sixth of the urgent land needs of the Indian population, as estimated by the National Resources Committee. The entire amount authorized for land purchases by the act of June 18, 1934, will have to be appropriated by the Congress for many years before satisfactory progress can be achieved in the economic rehabilitation of Indians upon an adequate land base. The sums appropriated for land purchases must be supplemented by sufficient additions to the revolving credit and Indian rehabilitation funds to finance the productive use of Indian lands.

It is interesting to note that those tribes which were allowed to retain in usable form sufficient resources for the support of their members have not been a heavy drain upon the United States Treasury. The Menominee Tribe in Wisconsin, for example, having maintained its timberlands in tribal possession without allotment and having operated this timber on a sustained-yield basis since 1905, has been paying all administrative, educational, and health-

service expenses, including operation of its hospital, out of its own funds. On the other hand, the tribes critically undersupplied with usable resources are requiring increasing amount for relief, not only from the Federal Government but from the States and counties as well. On the Turtle Mountain Reservation in North Dakota more than 1,000 Indian families have been endeavoring to eke out an existence on land barely adequate to keep 200 families from starving. Since drought and agricultural depression seriously restricted opportunities for off-reservation wage work, more than 90 percent of the Indian families have had to be kept alive by work relief and direct relief. Added to the heavy burden of relief for the rural white families, the needs of the Indians proved to be the final straw on State and county welfare finances. As a result, the State and county governments joined in a request that the Federal Government make the Indians self-supporting by purchasing for them sufficient land from which to obtain their livelihood.

ALLOTMENTS HAMPER LAND USE

Fully as important as the acquisition of new lands is the task of readjusting the ownership pattern of the land now in Indian ownership in such a manner that the land can actually be used by the owners. Individualization of tribal lands through allotment not only led to the sale of millions of the best allotted acres but so tangled and complicated the ownership status of lands still in Indian ownership that much of it cannot be used by them and must either be leased to white operators or lie fallow. Many of the original owners have died; their interests in the allotments have passed on to a second, third, and fourth series of heirs until there are numerous instances of 80-acre tracts in which 30 or 40 heirs own fractions of various sizes with denominators as high as one or two millions. Most of these inherited allotments have to be leased and the proceeds divided among the heirs, a sterile operation which compels the Indian Office to conduct a constantly growing rental business, to lease these millions of acres of heirship land, each lease requiring the approval of a majority of the heirs, to collect the rentals, account for them, and divide them among the heirs, with numerous annual payments of a few cents per heir. To this task is added the handling of the leases of many of the allotments still in the hands of the original allottees who are unable or unwilling to make productive use of their own lands.

If the bulk of the allotted and heirship lands, especially grazing lands, were consolidated in proper units and effectively used by the Indian owners, the economic problem on a score of reservations

would be approaching solution. Some land consolidation has been done, especially during the last two years, but the volume of heirship land to be leased has grown faster. More trained personnel and more funds for land purchases are sorely needed to solve this problem.

Thousands of Indian families, now petty landlords subsisting miserably on the tiny rental returns from their scattered allotted and heirship lands, supplemented chronically by direct and work relief, can be made self-supporting by the use of their own land, and the equitable distribution of tribally-owned lands, when certain legal obstacles are removed by Congress and the Indian Office is enabled to concentrate its efforts on the simplification of the ownership status and the consolidation of Indian allotted and heirship lands.

LIVESTOCK REDUCED TO SAVE LAND

The depression that began in 1929 reached its lowest point in 1932. At the same time the blight of drought had been spreading farther and farther over the Great Plains and the intermountain country. These social and physical phenomena had created a crisis in Indian as well as national affairs. To meet this crisis, there was launched in 1933, among other measures, the dramatic campaign for the conservation of human and physical resources which resulted in the establishment of the Civilian Conservation Corps and of the Soil Erosion Service, the latter set up under the Public Works Administration.

The first and the largest of the soil-conservation projects undertaken jointly by these two new organizations was on 18,000,000 acres of Indian lands in the Southwest, on the reservations of the Navajo and Pueblo Indians, upon the initiative of the Indian Service.

The Navajo Reservation, 235 miles long from east to west, 125 miles from north to south, covers the high and dry country of mesas and painted buttes in northern Arizona and New Mexico, spilling over into Utah. It is as large as the State of West Virginia, has only about 10 inches of annual rainfall erratically distributed, is between 5,000 and 10,000 feet above sea level, and is a good sheep country. The adjacent country of the Pueblo Indians has similar characteristics. In both areas the balance between the soil-building and the soil-destroying factors is most delicate. The continuation of that equilibrium depends primarily on the maintenance of an adequate protective cover of grasses and shrubs.

By 1930 the Navajos ran 1,250,000 sheep and goats on range unable to sustain more than 600,000 sheep. The tribe had increased in 70 years from about 10,000 to 45,000. Because the sheep ate the grass and brush faster than it grew, large areas were denuded, deep gullies formed in the shallow center of the cultivated valleys, drained the

rain water off the unprotected slopes before it could sink in and grow more grass, and carried the topsoil from hundreds of square miles in destructive floods to the Colorado River and Boulder Dam. Like an avalanche, the process of accelerated erosion gained momentum every year. Unchecked, the result of the process could only be the early creation of a sterile desert, permanent rationing by the Federal Government of the majority of this largest and most colorful tribe of hitherto completely self-supporting Indians, or their dispersal and disappearance.

The Navajos were confronted with the necessity of bringing their herds down from more than a million sheep to less than 600,000; for the Lagunas and Acomas even greater sacrifices.

There is something to be said for the Navajos' resistance to stock reduction. Even with complete restoration of the reservation, its carrying capacity will not exceed 600,000 sheep, or an average herd of not more than 50 per family if equally distributed. Under the present pattern of ownership, several thousand Navajo families must exist without livestock unless the range available to the tribe is greatly increased. Efforts to enlarge the reservation by purchase of privately owned lands have been consistently opposed by white owners and State officials. Apparently, therefore, the sole possibility of providing the means of self-support for the expanding Navajo Tribe is through the enlargement of the scattered areas of irrigated farm land. That opportunity is limited by the scarcity of water available for irrigation and the high cost of water development. Yet this problem must be faced. More range and more irrigation facilities must be provided if a large part of this virile group of first Americans is not to be placed permanently on a Federal dole.

The Laguna, Acoma, and other Pueblo Indians faced the problem of saving their range lands by the introduction of conservative management methods with a stout heart. During the fiscal year 1940, they completed the drastic program of reducing their herds to the estimated carrying capacity of their lands. In five years they parted with almost 60 percent of their total flocks, retaining only the best of their breeding animals. Several Indian families owning 800 or 900 sheep in 1935 came down to 350 in 1940. Though this smaller number produced more and heavier lambs per hundred ewes, though the amount of wool per sheep almost doubled under proper management, still these families sacrificed a substantial portion of their gross income and gave up any chance for an increase of their operations in the future. They made the sacrifice, they are continuing to make it, because they realize clearly that the future existence of the pueblo as an integrated community depends upon the salvation of

their lands, upon the maintenance of the full productivity of the soil by the application of conservation practices. That realization is slowly spreading among the Navajos.

Since 1933 the conservation movement has been spreading throughout the Indian country. The San Carlos Apaches did not hesitate to sell 1,200 yearling heifers, first-class breeding stock, when this sale became necessary to bring their herd down to the carrying capacity of their range. The Jicarilla, the White River and Mescalero Apaches, the Shoshones and Bannocks, the Utes and the Paiutes on a score of reservations in the intermountain country had by 1940 wholeheartedly adopted the principles of conservation in the management of their range lands. In the Dakotas and Montana restocking of the Indian ranges, almost stripped of livestock during the drought years, is proceeding on a conservation basis.

TIMBER RESOURCES CONSERVED

Conservation of timber resources on Indian reservations began on the Menominee Reservation in Wisconsin 35 years ago when the elder Senator La Follette induced Congress to authorize the operation of the Menominee timber as a unit on a sustained-yield basis. Thanks to this foresighted action, the Menominee Indian forest is still producing timber, and is still supplying the majority of the Menominee Indians with their livelihood and will continue to do so indefinitely.

Except for the continued ravages of the pine beetle the tribal timber of the Klamath Reservation in Oregon will under continued conservative management remain a productive economic asset for generations. On the White River and the Mescalero Apache Reservations, on the Colville, the Spokane, and other reservations the application of conservation principles and the management of the timber on a sustained-yield basis have strengthened the economic position of the Indian communities, maintained their morale, and reduced the relief demands. But conservative management with its beneficial results can be assured only on tracts of timberland in tribal ownership. Where timberlands have been allotted to individual Indians, sustained-yield operations are not assured indefinitely on account of the everchanging ownership of the land and the pressing need of the Indian owners for an income to assist in the development of homes and various industrial enterprises.

The Indian forested and range lands cover approximately 46,000,000 acres located in 20 States. Management problems are infinitely varied; they are complicated by the need of adjusting technically correct programs to the economic and social condition of the Indian owners. Yet the management of the forests, the sale of Indian

timber, the suppression of fires, the administration of the range lands, the direction of conservation surveys and operations on these lands have been carried on at an annual cost to the Government of less than 1 cent per acre. The income accruing to the Indians from their timber resources—\$1,390,000—plus the fees for the use of Indian range by white operators exceeded \$2,100,000 during the fiscal year 1940, an increase of nearly \$300,000 over the preceding year.

INDIAN CIVILIAN CONSERVATION CORPS PROTECTS FORESTS AND RANGES

The high degree of protection given Indian forests and range lands could not have been achieved without the cooperation of the Civilian Conservation Corps. In the control of erosion and the protection of forests and range against fire, flood, and insect damage, the work of the Indian Division of the C. C. C. has been of exceptional value for the Nation as well as the Indians. Conservation practices on thousands of square miles of highly erodible Indian range lands would have been impeded and made difficult without the stock-watering facilities, the thousands of miles of fences and truck trails constructed by the Indian Civilian Conservation Corps enrollees. The Civilian Conservation Corps-Indian Division's participation in erosion-control work has made possible the restoration of the grass cover, the refilling of gullies, the checking of wind erosion, the reseeded of denuded areas on scores of reservations.

On the Great Plains reservations the Conservation Corps enabled the Indian Service to make great strides forward in carrying out the recommendations of the President's Great Plains Drought Commission for the restoration of the water table. In cooperation with several divisions of the Indian Service and other Federal agencies, the Indian C. C. C. participated in a number of projects for the construction of small multiple-use dams to supply water for livestock, refuges for water fowl and fish, for recreation, and the irrigation of small subsistence gardens on Indian lands. In Indian forests firebreaks and truck trails have been built, fire lookout towers erected and manned, insect infestations have been attacked, and new telephone and radio communication lines established.

A most important byproduct of the conservation and resource-protection work of the Indian Conservation Corps is the training received by thousands of young Indians. Since the beginning of the program in 1934, more than 75,000 individual Indians have worked on Civilian Conservation Corps-Indian Division projects and have acquired experience in the construction of bridges, trenches, truck trails, barbed-wire fences, and communication systems. At least 4,000 Indians have learned how to operate and maintain tractors,

trucks, heavy road-building and other automotive equipment including portable welders, compressors and jackhammers, power shovels, rotary wheel scrapers, elevating graders, and other dirt-moving machinery. Special training courses in telephone and radio work have been given to selected enrollees, and summer schools in fire fighting have turned out hundreds of qualified leaders. Within the ranks of the Indian Civilian Conservation Corps there are now available several thousand trained men for service in or behind the front lines of a mechanized force for national defense.

An indication of the valuable skills acquired by young Indians while they serve in the Civilian Conservation Corps is given by the number of enrollees who annually leave ranks for other employment. Out of an average maximum enrollment of 10,000 Indians during the past fiscal year 590 found outside employment, 436 entered the regular Indian Service in different capacities and 1,003 made use of their experience within the economic framework of their own home reservations.

LANDS RESTOCKED FOR PRODUCTION

The attainment of permanent Indian rehabilitation on his land is beset by many obstacles. With few exceptions, such as the Pimas, the Hopis, and the Pueblos in the Southwest, the Indian tribes did not rely in prehistoric times upon cultivated crops as their main source of food supplies. They were hunters and gatherers, supplementing nature's offerings with patches of cultivated corn, beans, squash, and tobacco.

Indians did not improve their social standing by the accumulation and possession of material things. On the contrary, they gained merit by open-handed generosity, by giving away, by sharing their wealth. These traits still persist. Their persistence accounts in large part for the difficulty the Indian experiences in adapting himself to the ways of society which makes primary virtues of industry and thrift, which worships material possessions, and honors him who is able to pile up tangible wealth.

Most of the problem reservations lie in the former buffalo country, the plains region. At the opening of the century the transition from the buffalo to the cattle economy was well under way. Range livestock fitted into the traditional Indian way of life. Though initially the Indian was inclined to look upon cattle as a new species of game animal and treat them accordingly, he was learning fast. The allotting process paralyzed the Indian cattle industry; war prices, wheat, and drought killed it on many reservations.

But the drought was not an unmixed evil. At its height, when the United States bought and slaughtered hundreds of thousands of

cattle which otherwise would have starved, the Indian Service arranged through the Drought Relief Administration to obtain some 25,000 grade cattle and 15,000 purebred for distribution to Indians outside the drought area. A large cattle pool was organized. From it stricken reservations were supplied with new breeding stock, the recipients of the cattle agreeing to repay the pool a yearling heifer for every animal turned over to them. Notwithstanding the heavy drought losses, the organization of this pool made possible the continuous expansion of the Indian livestock industry on scores of reservations while the possession of purebred herds brought about a remarkable improvement in the quality of the Indian livestock. The size of this achievement is illustrated in the following figures:

Expansion of Indian Beef Cattle Industry

	Calendar year	
	1933	1939
Number of cattle.....	167, 313	262, 551
Money income from.....	\$263, 095	\$3, 126, 326
Number of Indians owning.....	8, 627	16, 624

The income from all Indian livestock, including sheep and dairy cattle, showed an increase from \$2,087,000 in 1933 to \$5,859,000 in 1939.

INDIANS RECEIVE CREDIT

The second important factor in stimulating the expansion of the Indian livestock business was the operation of the revolving loan fund established under the Indian Reorganization Act of 1934. Before the establishment of this fund, the Indian did not have access to adequate sources of credit. He could not pledge trust land as security for commercial credit. The annual appropriations for loans to Indians were wholly inadequate to meet Indian needs and, because of their inadequacy, they were all too frequently used for relief instead of productive purposes. Almost 50 percent of all the loans from this revolving fund, now containing \$4,444,100, went for the purchase of livestock, plus an additional percentage for equipment needed in livestock operations.

Despite this excellent showing for the Indian population as a whole, progress in the rehabilitation of the allotted reservations through the expansion of the livestock industry has been discouragingly slow. On the Pine Ridge and Rosebud Reservations in South Dakota, with a population of 16,000 Sioux, a majority of the Indians in 1940 still derived all or part of their living from the Federal Government. They had range land enough to support 100,000 cattle, yet the total

number of cattle owned by Indians was only about 18,000 head, and 55 percent of the families were without livestock of any kind. These two reservations furnish an excellent example of the difficulties encountered in the task of rehabilitating Indians on allotted lands valuable chiefly for grazing.

The total Indian lands on these two reservations comprise 3,120,000 acres, practically all of it allotted to individuals and their heirs. The most productive tracts, especially those along the watercourses, have passed out of Indian ownership. Few Indian families control enough land in one block for even a small cattle enterprise. In order to make a livestock enterprise possible, it is necessary first to block out a balanced grazing unit completely controlled by Indians. In such a grazing unit there may be a hundred or more Indian owners of land or interests in land and 20 or more non-Indian landowners. Nearly all of the land, both Indian and non-Indian, in such a unit may be used under permit by a nonresident operator. To block out and consolidate 3,000,000 acres for Indian livestock production, personnel trained in land exchanges and purchases will be required, plus a continuously available fund for the purchase and leasing of key tracts. Only a bare beginning has been made in this consolidation process. Neither the funds nor the personnel have been available.

LIVESTOCK ASSOCIATIONS

Given a consolidated grazing unit, the next step is the organization of the users and the financing of the operation. Since the best the average Indian family can hope for on the basis of available land is a herd of less than 80 head, much smaller in the beginning, single-family operations are uneconomic. Therefore, a cooperative livestock association handling a number of small family herds on the grazing unit has to be organized. This cooperative method has made possible the remarkable increase in Indian-owned cattle during the past seven years, during which the Extension Division was able to organize 150 livestock associations.

Next a livestock association controlling the necessary grazing land has to acquire cattle. It may obtain some of them from the repayments of heifers to the cattle pool, or it may finance the purchase from the revolving loan fund if the tribe is organized and chartered under the Indian Reorganization Act. In either case the participating Indians must work out with the assistance of the extension and credit agents a program of operations covering the period during which the loan is to be repaid and must make satisfactory arrangements for the proper management of the enterprise.

The same method, advance planning, and insistence on proper management and supervision, has been applied to all loans made to

Indians as far as the dearth of trained personnel and funds would permit. The results of applying sound business methods to these credit operations have been eminently satisfactory. As of June 30, 1940, commitments of \$5,566,546.44 were outstanding, including loans to tribal corporations, credit associations, individuals, and cooperatives. The loans spread over 20 States and Alaska, and included funds for the purchase of livestock and equipment, for the construction and operation of salmon and other canneries, for the operation of fishing enterprises, sawmills, farms, and a dozen other purposes. Despite the far-flung nature and the variety of purposes of this banking business, the scheduled repayments by the Indian borrowers have been made so punctually, the advance planning and the Indian participation in the management of these thousands of enterprises have been so effective, that only a small percent of the loans are delinquent or in the process of foreclosure.

INDIAN IRRIGATION

The grass lands of the northern Plains normally offer some of the finest range in the West, but livestock must have feed and shelter during the very severe winter months. And no operator is safe unless he has a large reserve of hay against the recurring years of drought in addition to his winter feed. In years of normal rainfall, winter and reserve hay can be put up on the wetter parts of the range, provided the hay crop can be financed for holding, but for safe operation during dry cycles, irrigation supplies the best guarantee against excessive losses.

Permanent rehabilitation of the Indians on the Great Plains, in fact almost everywhere west of the one hundredth meridian, requires that the productivity of the relatively small amounts of land remaining available for their use be increased by providing irrigation facilities. The necessity of this process was recognized by the Indian Office as early as 1867 when Congress appropriated \$50,000 for the construction of diversion works and irrigation canals on the Colorado River Reservation in Arizona. Since that pioneer effort, the area of Indian lands susceptible to irrigation has been expanded to 1,250,000 acres, of which 800,000 acres now have distributary systems. About \$50,000,000 will be required to complete the work for the entire acreage in approved projects. The cost of operating and maintaining these Indian irrigation projects averages about \$1,500,000 annually; two-thirds of this cost is covered by collections from water-users. Appropriations for new construction have run from \$2,000,000 to \$7,000,000 per annum. These construction costs become a lien against the benefited lands, but they are not collected while the land remains in Indian ownership.

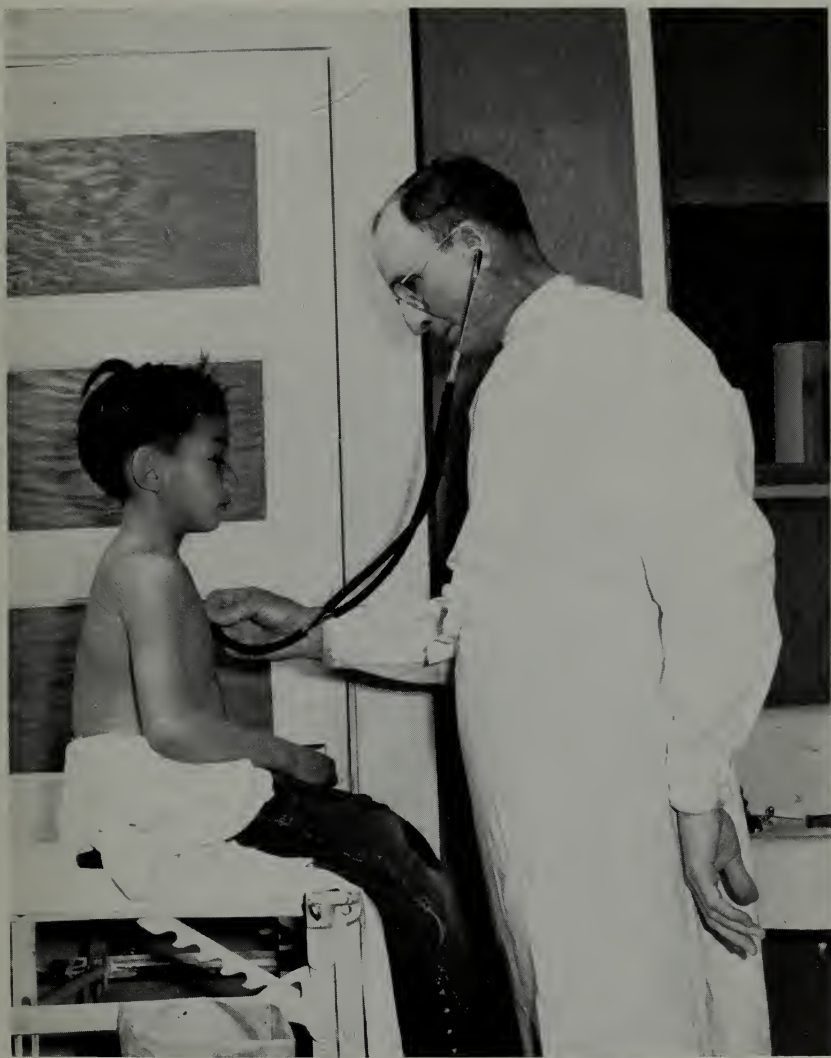
IRRIGATED LANDS AND INDIAN SELF-SUPPORT

The effect of irrigation facilities on the ability of the Indians to support themselves is shown by the example of the 12,000 Pueblo Indians who have produced crops under irrigation for at least a thousand years. For several years, drought conditions notwithstanding, the Pueblos have not received direct relief assistance from the Federal Government, not even Social Security benefits for the aged. On the Fort Peck, the Fort Belknap, Blackfeet, Crow, and Rocky Boy's Reservations in Montana the production of reserve forage on irrigated land is beginning to rebuild the livestock economy of these tribes on a sound foundation. At the same time irrigation for forage production will make possible the correction of improper land-use practices by returning to grass large areas optimistically plowed for wheat production.

In the Plains area the development of water for the irrigation of hundreds of truck gardens varying from 5 to 200 acres is assuring subsistence in drought years to numerous groups; larger irrigation projects in this problem area will in time enable a number of the Sioux Tribes to rebuild their cattle economy on a safe basis and provide an avenue of escape from an almost hopeless situation. By the same token the Navajo Tribe of 50,000 souls must look to irrigation for its eventual salvation. Even though the cost of constructing irrigation works on Indian lands is in the nature of a subsidy, the money is well invested as it helps to keep Indians off a permanent Federal dole and at the same time removes the necessity for destroying the range on the watersheds by overuse and misuse.

GOVERNMENT DOES NOT PENSION TRIBES

It should be emphasized that the United States has never as a matter of national policy supported or pensioned its Indian tribes. The Government is not supporting the Indians now. Because the Indians are the special concern of the Federal Government and because their lands are held for them in trust by the United States, and therefore, are not subject to State and local taxation, the Federal Government under the terms of various treaties has assumed the cost of educating Indian children, of rendering the Indians medical and hospital service, of building roads on Indian reservations, of constructing irrigation facilities on a reimbursable basis, of administering Indian lands and Indian estates, and of supplying agricultural advice and credit for Indian enterprises. Aside from a small amount for the relief of aged and indigent Indians, no money has been appropriated for the unearned use of able-bodied Indians since the beginning of the century except an insignificant amount in ful-



MODERN MEDICINE MAN GUARDS INDIAN HEALTH.

Examinations like this safeguard health among the Indians under the program for national conservation administered by the Office of Indian Affairs.



OLD CEREMONIES AND NEW.

Observance of old tribal customs and increased opportunity for self-government by the Indians is a fundamental policy of administration under the Department of the Interior. Upper: Indians of Taos, one of the 19 ancient villages of New Mexico, perform a religious ceremonial dance. Lower: The Santa Ana Pueblo Tribal Council in session.

fillment of certain treaty obligations. Approximately \$15,000,000 a year, almost one-half of the regular appropriation, is spent for the education of 80,000 Indian children of school age and for the Indian Medical Division. The construction and maintenance of roads, irrigation works, schools, hospitals and quarters absorb another \$8,000,000 annually.

In these appropriations for Federal services to Indians there are no funds for a general Indian pension system, and the appropriations to help the Indians make more effective use of their land, expenditures for agricultural extension work and for credit operations, have averaged not quite \$1,000,000 a year for the last 7 years. Yet it is through the wise, effective expenditure of the appropriations for agricultural extension and credit that the Indians can be lifted out of the economic subcellar and placed in a position to earn a decent livelihood by their own efforts on their own lands.

INDIAN HEALTH

Good health being one of the prime essentials of any program of national defense, the rapid advancement of Indian health work, and the recently accomplished results of the Indian Service program of research and treatment, constitute an important contribution to the national cause. Striking success in the treatment of tuberculosis and trachoma has been recorded within the past year.

The conservation of Indian health, the improvement of Indian morale, and the betterment of the physical, social, economic, and spiritual conditions among the Indians of the United States proper and Alaska cannot be told in detail within the space of a brief report. Only a few of the highlights and some of the interesting background features can be told. It is a story of human conservation, scientifically applied through the medium of medical workers whose application of modern methods must continually be adjusted to the ancient beliefs, ceremonies, traditions, and taboos of the many Indian tribes and bands.

As a privilege of free peoples, tolerance in the practice of local customs and beliefs is essential to a democracy. Yet for generations, religious liberty was not permitted to the Indian tribes, while the curing ceremonials, an essential part of their faith, were discouraged. Few persons considered of value the mental stimulus produced by the powerful song prayers and the fact that through generations of testing, these "Medicine Men" had acquired an extensive knowledge of medicinal herbs and the use of practical therapeutics in the form of massage, sweat baths, cathartics, and cauterizations.

Years ago the Indian people were reluctant to accept modern medicine, because it was in direct conflict with centuries of superstition. The

white doctor performed treatment without ceremonial prayers. And because it was customary with some tribes to abandon the house of the dead it was hard for the Indian to accept the hospital principle. Medicine men among some tribes, particularly the Navajo within the last decade, began a campaign of chants and ceremonies against doctors and nurses. But gradually, as skilled treatment brought the ill back to health and as health education proceeded in the schools, the Indians themselves began demanding new hospitals, clinics, and medical facilities.

As evidence that it by no means wished to interfere with or belittle the Medicine Man's religious role in tribal life, the Government recently invited Navajo medicine men to participate in the dedication of two Federal hospitals. The fact that the Navajo medicine men offered the prayers with which they bless their own homes in the dedication ceremonies demonstrated a reciprocal appreciation and realization of their own limitations in the face of modern science. Of similar interest, a full-blood Osage Indian, Eugene Butler, Jr., presented the Indian Pawhuska Municipal Hospital in Oklahoma a few months ago with an X-Ray machine of the latest model.

HEALTH THROUGH EDUCATION

Care is taken never to force the patient, but to see that he or she completely understands and is willing to undergo the treatment. Native attendants act as interpreters. Parents are consulted in the care of children. No operation is performed, except in the case of accident or emergency, without the written consent or thumb-print signature of the patient.

The increased development of community day schools has assisted this program of health education, bringing both children and adults into closer and continuous contact with health objectives.

Instruction is readily available and not academic, but adjusted to meet local conditions.

In the belief that it is neither necessary nor desirable to change the dietary habits of Indian children simply because these do not coincide with our own tastes, studies of native foods and native ways of preparing foods have been made in certain areas. Indian schools have then included these foods on their menus, thus giving dignity to native customs and encouraging children to evaluate their own practices before discarding them for new ways. Because of the high infant mortality among Indians, instruction in infant care is given in high schools, the class often adopting an infant and giving it full care.

In addition, public health field nurses, agency and hospital physicians through informal talks, prenatal, and general health clinics and home visits are in constant communication with tribal groups. Through their efforts, Indians are learning first-aid, how to care for minor illnesses, and how to carry out doctors' orders.

This approach to health problems has produced very favorable results. Natives now are eagerly asking for information, seeking training as attendants in hospitals, and cooperating in innumerable ways to carry the program forward. There are 92 Indian nurses, 2 Indian doctors, and 44 native nurse aids employed. A Sioux physician, Dr. George F. Frazier, won the 1939 Indian Achievement Medal bestowed by the Indian Council Fire of Chicago.

With the increased use of and demand for hospital facilities, there has been a corresponding increase in medical personnel and construction of buildings. During the past ten years, 14 new hospitals have been completed, 22 have been replaced by modern structures, and 12 have been extensively enlarged or remodeled, and equipped with modern appliances. Many other hospitals have been improved on a lesser scale. There are now 90 hospitals operated by the Indian Service in the United States with 4,500 beds of which over 1,500 beds are for tuberculosis cases.

Beside the in-patient care of hospitalized Indians, dispensaries, or out-patient offices, are scattered throughout the Service in the hospitals and at outlying stations. Here Indians come for treatments which do not require hospitalization, but warrant medical care.

NAVAJO USE OWN FUNDS FOR DENTISTRY

Dental treatment was given to a great many patients by full-time itinerant and hospital dentists and to many other patients by part-time dentists. Native interest in this work is evidenced by the fact that the Navajo Tribal Council petitioned Congress to set aside \$5,000 of their tribal money for the development of a dental unit in their new hospital at Fort Defiance, Ariz. The petition was approved and the Indians are reimbursing their tribal fund with the payment of dental fees.

Additional medical facilities have been provided by operation of the Johnson-O'Malley Act of 1934, authorizing cooperative contracts with State board and local health units for services to Indians. By Executive order of May 1936, Indian Service physicians were authorized to accept appointments as deputy State health officers, making them valuable liaison officers between State and Federal Governments.

Cooperative health programs may be seen on a large scale in Oklahoma, North Carolina, California, Wisconsin, Minnesota and, to a small extent, in Utah. Where full-time health services are operated by State or local boards of health in the vicinity of Indian reservations, they are partly financed by Indian Service appropriations. State Boards of Health are responding generously in the control of venereal disease among Indians by the use of State laboratories for blood examinations, by opening State clinics to Indians, and, in instances where Government facilities are not available within the immediate terrain, by providing medical care on a contract basis. Thus by a combination of Federal, State and local resources, a more sensible approach to the prevention of disease for a whole population is achieved.

The United States Public Health Service, through its engineer corps, made possible a sanitary engineering service which has been available to the Indian Service for some years. During the last year 100 agencies and Indian institutions were visited and surveyed, 64 reports of surveys were submitted, 64 conferences attended, 8 water-treatment plans prepared, 12 sewage-treatment plans prepared, and 74 Indian Service sanitary plans reviewed.

RESEARCH IN TRACHOMA AND OTHER DISEASES

In the field of medical research, much attention is being paid to the treatment of tuberculosis. The general tuberculosis rate among Indians is nearly 10 times that of the white population and the death rate is five to six times as great. Intensive medical surveys to discover the incidence of the disease have been made and are now in progress on several reservations.

The Director of the Henry Phipps Institute of Philadelphia, Pa., is a consultant in tuberculosis for the Service. Every year doctors and nurses of the Indian Service are sent to the institute, not only for specialized training in tuberculosis, but to assist the institute in the examination and interpretation of the thousands of X-ray plates sent in from various reservations.

Under the immediate direction of the Phipps Institute, outstanding studies are now being undertaken on the effect of the Bacillus Calmette Guérin vaccine, or B. C. G., in the control of tuberculosis. The studies embrace four scattered reservations in the United States and a group of natives in southeastern Alaska. To date, 1,565 children up to 19 years of age have been given this vaccine intradermically in doses of from 0.10 to 0.15 milligram. Up to the present time only 6

cases of pulmonary lesions, 4 being of the childhood type, have been reported among the B. C. G. group as compared with 30 cases reported among the control group, 21 of which are of the childhood type. These studies on the effects of vaccination have been extended to new-born children, but have not progressed to the point where a report can be made.

The eye disease, trachoma, is a great scourge of the Indian race. The rate varies according to the tribe, ranging from as low as 1 or 2 percent in some tribes to 30 percent in others. Trachoma is treated both by hospital and field physicians and by an itinerant group of trachoma specialists and nurses. In the past trachoma has been treated by surgical procedure, with applications of copper sulphate, silver nitrate, chaulmoogra oil, boric acid, and other chemical compounds common to trachoma therapy.

Cooperative work by Dr. Phillip Thygeson, of Columbia University; Dr. Polk Richards, of the Indian Service; and the late Dr. F. T. Proctor, of Santa Fe, at the Trachoma School on the Fort Apache Reservation, Ariz., demonstrated that trachoma was due to a filterable virus. These findings were reported before the American Medical Association in June 1938. At the same meeting Dr. Fred Loe, of the Indian Service, reported his early work with sulfanilamide in the arrestment of trachoma. Since then experimentation with sulfanilamide therapy has gone on intensively in a few centers and results have exceeded the most optimistic expectations. During the last year, 1,023 Indians started sulfanilamide treatment and 959 completed the treatment after three weeks. After three weeks 43 percent were pronounced arrested and 50 percent improved. Subsequent arrestments and improvements were found on later examinations after all treatment was stopped. After these encouraging results treatments are being extended further this year, and the whole plan of attack on the trachoma problem modified accordingly.

Other research studies have been conducted, such as investigation of infectious dysentery among infants and children of the Pueblos, and investigation of the relationship between dental caries and dietary habits among a primitive group of Indians in Alaska. The dental investigators reported that the use of refined sugars was the main factor in promoting dental caries.

A malaria survey among certain Indian groups in southeastern Oklahoma, where the rate of severe malarial infections is reported to be very high, is now in progress. This survey was undertaken in cooperation with the State board of health in May 1940 and will be completed by this fall.

DEATH RATE IS DECLINING

Through a combination of efforts in the field of medical care, research, and public health, there has been a decrease in the general death rate through the years. The death rate for the calendar year 1938 was 13 per thousand, as compared to 14.9 per thousand for the year before. The birth rate remained about the same, 22.7 per thousand live births during the calendar year 1938 as compared with 22.9 for the year before. This gives the Indians an increase of births over deaths of 9.7 per thousand.

SCHOOLS AND THE USE OF INDIAN RESOURCES

Teaching Indians to make wise use of their own resources, encouraging and assisting them toward better self-expression, fitting their cultural and other gifts into the pattern of national and community life, finding new and more effective ways of teaching basic conservation facts, and discovering and recruiting better Indian Service teachers: these have been some of the high-lighted activities in the broad field of Indian education in the past year.

There has been a great emphasis throughout the Indian schools, not only on the preservation or revival of native handicrafts, but also upon self-expression through painting, wherever possible, in a perpetuation or revival of traditional forms of expression.

The Santa Fe Indian School, located in the heart of the Pueblo Country where painting is a prehistoric art, has gained increasing prestige for the work of its students. In 1940, a 17-year-old artist, Ben Quintana of Cochiti Pueblo, N. Mex., a student at the Santa Fe School, won a first prize of \$1,000 in a Nation-wide art competition among 52,587 high-school students. Seven other young Indians out of a total of 10 who entered the contest also received cash awards, and 1 youth, an honorable mention.

During the past year Andrew Standing Soldier, a young Sioux artist, was commissioned to paint the murals for the Post Office at Blackfoot, Idaho, on the Fort Hall Reservation, where a group of Bannock and Shoshone Indians live.

Six other Indian artists—one from Zia Pueblo, one a Navajo, an Oklahoma Apache, two Kiowas, and a Pottawatomie from Oklahoma—were selected to decorate with murals two large rooms in the new Department of the Interior Building, Washington, D. C.

These are the success stories of a few gifted individuals. The Federal Government will continue to encourage them and others in creative expression, emphasizing always the desirability of perpetuating native art traditions, but recognizing the right of Indian genius to assistance in whatever form it may appear.

CHANGED REQUIREMENTS FOR TEACHERS

Until three years ago it was possible for a young woman who had never lived anywhere except in a modern apartment building where she turned on the heat, pushed a button for light, and telephoned to the store for groceries, and who had taught only white city children an established curriculum, to pass brilliantly a Civil Service examination for an Indian Service teaching job. Subsequently, she might find herself living in a cottage 60 miles from the nearest town and 40 miles from medical help via dirt roads, stoking a wood stove for heat, cleaning oil lamps, and teaching a varied group of Indian children who understood little English and little of white ways, and whose main concern outside of school hours was helping their parents to get enough to eat from inadequate land.

These Civil Service teaching examinations have been completely revised through cooperation between the Indian Service and the Civil Service Commission. Within the last two years two examinations have been announced which demand qualifications more in keeping with Indian Service needs. Rural living, training for rural life, teaching in schools which actively participate in community activities, and experience in adapting curricula to local needs, are some of the qualifications now demanded in the examinations which are supplemented by personal interviews tending to reveal such human qualities as initiative, ingenuity, and sympathy with the problems to be faced.

Teachers chosen through these newer examinations are being sent into remote Indian communities. These teachers make friends with the older Indians of the community, inaugurate school gardens which rapidly spread to become community gardens, and through initiating school children in the care and value of livestock and farming, arouse community interest in the school program. Adult women in the community are encouraged to visit the school to learn how to cook, sew, and preserve the newer foods in newer ways. The men of the community are invited to use the tools and equipment of the shop for home improvement and care of farm equipment. Close cooperation between such teachers and representatives of the Extension Division have doubled the effect of both the educational and agricultural extension work on many of the reservations.

SUMMER SCHOOLS FOR IN-SERVICE TRAINING

Besides revitalizing the Civil Service requirements for teachers, the Indian Service during the past four years has sponsored a series of summer schools to aid teachers as well as other Federal employees to

understand the specialized problems of the many diversified Indian communities.

One-third of the Alaska teachers (77) spent 6 weeks this year in active exploration of Alaskan problems, and more than 130 teachers from the Northern States spent four weeks at Chemawa, Oreg. The Santa Fe summer school drew the largest attendance of any Indian Service summer school, over 400 employees being registered.

To familiarize adult Indians with the educational program on the largest and most difficult of all reservations, adult schools were organized for periods of 10 days to two weeks each at several of the Navajo Service boarding schools during the year just past. Fifty-five Navajo men and women, ranging in age from 19 to 71, attended the first of these two-week sessions at the Wingate Vocational High School in New Mexico. Community leaders, school board members, and present and former council members, keenly interested in the future of their people, made up the major part of the group. Many of them had never slept in a bed before and were totally unfamiliar with white ways of life. Most of them were illiterate and had never learned to speak English.

The success of this and later sessions held at other Navajo boarding schools has led to plans for similar programs in the future.

Despite the efforts of missionary groups and the Federal Government, more than 95 percent of the adult Navajos are still illiterate. Although school facilities have doubled on the reservation during the last eight years, more than one-third of the children of school age are still not enrolled in any school. Communication with most Navajos must, therefore, take place in the Navajo language through the services of native interpreters, many of whom have themselves only a limited education. To facilitate the interpretation of English material into Navajo in advance of its oral delivery, and in an effort to spread literacy among the Navajos in their own language, the Government has for six years been encouraging the development of a simple popular Navajo alphabet.

In the past year appeared a simple, popular alphabet suited to use with the average typewriter or linotype, which will be introduced in a limited number of Navajo schools during the coming year.

TEXTBOOKS IN TWO LANGUAGES

Simple readers on Navajo life, both in English and Navajo, have been prepared. Also large colorful posters by a Navajo artist, illustrating key points in sanitation, stock breeding, farming, or education, have been prepared for posting at day schools, trading posts, and other centers. A phrase book in Navajo and English has been prepared

for use by the Indian Service Medical Division. Study is under way on a Navajo dictionary.

A similar attempt to encourage literacy in the native language has been undertaken on the Hopi Reservation. At the urgent request of the Dakota Sioux, similar materials in English and Teton-Lakota, the most widely used of the Dakota dialects, are in preparation.

The Education Division has also undertaken the publication of several other series of booklets for use in Indian schools to provide a basis for the study of Indian history and to promote the preservation and development of native handicrafts. The life and customs of the Southwestern tribes are being treated in a series of pamphlets published at Sherman Institute, Riverside, Calif., four volumes of which will be completed during the current year—(1) The Northern Paiute Indians of California and Nevada; (2) The Indians of Southern California; (3) The Papago of Arizona and their relatives, the Pima; and (4) The Pueblo Indians of New Mexico. The Indian handicraft series already contain (1) The Quill and Beadwork of the Western Sioux and (2) Navajo Native Dyes. Others in this series now in preparation include "Pueblo Embroidery," "Seneca Basketry," and "Handicrafts of the Ojibwa."

Another type of booklet published during the past year by the Indian Education Division contrasts in pictures the tragedy of soil erosion with the fruits of range control.

Cooperatives for Indians, a series of lesson sheets on organization of consumer and marketing cooperatives, provide information for those tribes wishing to organize tribal enterprises under terms of the Indian Reorganization Act of 1934.

Young Indian artists have been employed to illustrate most of these pamphlets and the printing has been handled by student apprentices in the print shops of several Federal Indian schools.

BEGINNERS LEARN CONSERVATION

With the cooperation of the Soil Conservation Service, simple conservation facts have been incorporated into the teaching of the fundamentals of reading, writing, and arithmetic, particularly in the semi-arid Southwest.

While still in the lower grades, Indian children begin learning simple conservation principles through demonstration on land outside the classroom. As they progress to higher grades, the study of conservation and the land is correlated with the study of American history and the geography of the country as a whole.

Twenty years ago the Federal Indian boarding schools required students to do much of the manual labor connected with the maintenance and operation of these schools. Today, while many young Indians may be seen working around the schools, they do so of their own choice. Through the selection of certain subjects, they may earn a little cash as spending money or a share in the livestock, poultry, or whatever other field of activity they have chosen as a vocation after leaving school. In the day schools students often begin farming on their own land or that of their parents under the supervision of skilled instructors. In the boarding schools those students who select agricultural training may, through contract with the school, borrow a certain number of livestock, poultry, or seed, and through their enterprise return the cost of the school's original investment, as specified in the contract. At graduation they take their material assets home with them, where they may serve as a beginning for their future enterprise, or sell them for cash.

Since 1936, 40 agricultural instructors have been added to teaching staffs in important Indian areas, and the number of student enterprises has almost doubled every year.

As a step toward adjusting the Federal-school programs to the varying needs and opportunities for Indians to secure economic self-sufficiency in different Indian localities, surveys have been made in four widely diverse Indian areas.

The surveys indicated that two-thirds of the graduates from Federal Indian schools found full or part-time employment. About half of this number received employment under Government auspices, many of them in the Indian C. C. C. or W. P. A. while many of the remaining students were not receiving wages but were employed at home assisting with the family enterprises or managing their own. Important was the fact that only a negligible number of Indian students found employment in private enterprise. At Pine Ridge, S. Dak., only three out of 128 boys surveyed had obtained jobs in private industry, despite the fact that Indian students attending the Federal vocational or trades schools receive much more intensive training than white students experience in most public schools.

DAY SCHOOLS ARE COMMUNITY CENTERS

The Indian day schools are increasingly undertaking to supply resources to be shared by the entire community. For example, on many of the Arizona and Dakota reservations the primary need has been the development of an adequate supply of potable water, and the day schools have led in developing water sources for the use of the immedi-

ate communities. In other areas the day schools may serve as gardening or livestock centers.

Community bathing and laundry facilities, as well as workrooms with sewing machines and other equipment, are made available to all the adult members of the area, as well as to the children. Showers at the day school are supplementing the sweat baths, sand baths, and similar native methods of achieving cleanliness in arid areas. Many Indian women are bringing the family wash from distances of 10 to 20 miles to make use of the white man's laundry and bathing facilities.

In 1929 there were 131 Federal Indian day schools in the United States. The number today has increased to 211; and since 1933, Indian school children's attendance has more than doubled. Adults also have responded in increasing numbers to the educational program during the past seven years as more and more community facilities were made available at the day schools.

The attendance at the boarding schools has proportionately decreased, as the day schools have been established. Since 1933 the boarding-school attendance has dropped about 6,500. In the past 10 years, 25 reservation and nonreservation boarding schools have been closed.

The total number of all Federal Indian schools, including the reservation boarding schools, many of which have been reorganized as vocational high schools, operating on a day as well as a dormitory basis, number about 260. Other schools are now under construction, and still more are needed.

In those areas where Federal Indian schools are not maintained because other schools are accessible, the Federal Government contributes to the State or private agencies a part of the cost of schooling children of one-fourth or more Indian blood. An estimated 45,000 Indian children attended public schools during the past year in all the 27 States in which Indians are under Federal jurisdiction.

INDIAN EMPLOYMENT

The passage of the Indian Reorganization Act in 1934 giving Indians preference in the Indian Service staff increased the number of a few hundred permanent Indian employees in 1933 to 4,682 permanent employees in 1940. As of June 30, 1940, there were 8 Indian superintendents, 251 Indians in professional positions, 935 Indians in clerical jobs, and approximately 3,475 Indians in other skilled jobs.

The Indians in regular and temporary positions represent over one-half of the entire Indian Service staff. In addition thousands of Indians have been employed intermittently to build roads, hospitals,

schools, wells, dams, community buildings, and homes on their reservations. Through the Indian C. C. C. division and the extension of other such emergency funds as P. W. A., W. P. A., and emergency relief, many necessary physical improvements have been installed on 200 reservations, while at the same time thousands of Indians have received employment and training opportunities in skills formerly unavailable to them.

Today there are more carpenters, painters, mechanics, truck drivers, radio operators, machinists, surveyors, draftsmen, and engineers among the Indian population than ever before.

Only a decade ago the arduous trails and bypaths on Indian reservations restricted travel and were a positive barrier to economic and social development. Day schools were well-nigh impossible; doctors and nurses reached homes of the sick only after long delay and much difficulty, if at all; large areas of land were inaccessible; and farm and home services were but partially effective.

During the past year 263 miles of new roads were completed, 184 miles of road were regraded to adequate standards, 278 miles of road were gravel surfaced, and 118 miles resurfaced; 87 major bridges were built. There are now 5,232 miles of serviceable graded roads on 200 reservations in 24 States. There still remain, however, numbers of Indians in inaccessible locations reached only occasionally by the Federal Government's services. Improvements must be made on 6,150 miles of old and nearly impassable roads and trails before urgent requirements are met.

Many of the reservation roads constructed during the past seven years are connecting links between important Federal and State highways. They form part of the major network of roads available for military transport and provide access to material defensive resources.

The Indian is coming to be recognized as a competent road builder, and a considerable number have recently obtained skilled positions with private contractors and other road-building agencies. Road and bridge construction alone under the Indian Service has provided employment for as many as 14,000 Indians in a single season. As a result, there are today over 1,300 well-trained Indian mechanics in this field alone. Many of the road projects are manned 100 percent by Indian labor.

In the construction of buildings on Indian reservations during the period 1933 to 1939, approximately 80 percent of the funds spent for labor went to Indians. Thus Indians earned an estimated \$7,926,000 during these years in constructing schools, hospitals, and agency quarters operated by the Indian Service.

During the past fiscal year, 21 schools, 42 cottages, 12 dormitories, 7 barns, and 4 office buildings were among the 107 Federal structures constructed on reservations. This brought the number of modernized Federal buildings, sponsored by the Construction Division during the past 7 years, to a total of approximately 500.

On the basis of estimates submitted by various superintendents, about 570 more administrative buildings will be needed during the next 6 years, including 62 schools, 35 employees' buildings, 13 hospitals, 224 cottages, and 129 dormitories.

Probably most important to the Indians themselves have been the projects provided by the Rehabilitation Division through the Emergency Relief Appropriations Acts of 1935, 1937, 1938, and 1939. Although the funds have been limited, providing not more than an average of 6 months' employment for 2,000 Indians annually, the use of the funds in conjunction with the coordinated efforts of other divisions of the Indian Service has been far-reaching.

In helping the Indian to become self-supporting, in some areas the Federal Government is faced with the problem of complete resettlement of Indian families. For example, many Blackfeet Indians moved to Browning, Mont., as no opportunities existed for them to work on their outlying reservation lands. They lived in hovels in the vicinity of the agency headquarters. Other Blackfeet families were scattered about the reservation, eking out an existence wherever they could find it. Through the rehabilitation program, 50 families were established on irrigated tracts of reservation land, where they built houses and barns, planted gardens, and acquired livestock. Additional grazing land was made available to them. Some of the families who have now been settled for two years have made exceptional progress. They have kept their houses in good condition, increased their herds, and met their credit obligations.

Of similar interest is the rehabilitation of a group of Indian families living in dilapidated shelters along the Swinomish Slough, near La Conner, Wash. An eyesore to the people in the vicinity, this Indian community earned a meager livelihood by fishing. Attractive homes were built somewhat back from the slough, and the water front was cleaned up. These Indians very promptly became self-respecting people.

Other Indian communities have been given assistance in various ways: in establishing arts and crafts centers; in constructing granaries, canneries, root cellars, sawmills, dipping vats, and other projects which the community as a whole could use.

During the past year, 449 new Indian houses were built, making a total of 2,482 constructed during the rehabilitation program. Old

houses repaired during the past year numbered 872, bringing the total number of old houses which have been made livable to 4,540. Twenty-four community self-help buildings were under construction and 21 others were being repaired, bringing the total number of Indian self-help buildings assisted through emergency funds to 241. Work was undertaken on 65 canning and sewing centers during the past year, and numerous other community projects were in operation.

EFFORT TOWARD BETTER PERSONNEL

The beginnings of modern personnel work in the Indian Service were made in 1939. Indian participation was sought in all Federal activities concerned with Indian affairs, and this participation was given added momentum by the Indian Reorganization Act of 1934, by the conservation programs carried out largely by the Indians themselves; and by the cooperative planning for economic and political self-sufficiency in which the Indian plays a primary role.

The ideal of the Indian Service personnel has been initiative and anonymity, to the end that the Indians should eventually lead themselves.

With the objective of providing for the Indian's present-day needs without destroying his future capacity for self-government, the Indian Service has made many changes in its personnel policy:

1. Much responsibility formerly held by Washington officials has been shifted to the field superintendents and their staffs. They have been encouraged, even required, to develop programs of work fitted to the extremely variable local situations.

2. Constant examination of the employed personnel, with a view to discovering any shortcomings which training might overcome or undeveloped capacities which training might perfect, and any unused talents which a changed job in a new locality might bring into use. This analysis of the employed personnel has not yet been brought abreast with comparable work in other Federal agencies. But the whole organization of the Service, including its field offices, has been awakened to this most insistent of all problems: that of determining how each employee can best serve the Federal Government and the Indians, and how each employee's potentialities can best be developed, through in-service training or supplemental education in colleges and technical schools.

3. Expansion of in-service training. This training is carried on not only at the summer schools for field personnel but has pervaded the regional meetings of technical and professional personnel, the superintendents' councils, and the activities of many local jurisdictions.

4. Developing future administrative personnel. The experiment of the Southwest Field Training Program at Albuquerque, N. Mex., is now three years old, and while the program is far from perfection, it can no longer be considered merely experimental. A limited number of college graduates seeking a career in the public service are chosen from several hundred applicants at the universities each year. For 12 months these dozen or so men are trained and tested through administrative assignments of increasing severity and complexity. Each one is assigned directly to an Indian community. For example, one trainee was asked to study the trading problem at Zuni Pueblo, N. Mex., and work out an agreement relating to the traders' prices and the debts of Zuni Pueblo Indians, while negotiating with the traders for the establishment of uniform prices on certain staples purchased by the Indians.

A grant by the Rockefeller Foundation, approximately matched by Government funds, supports the program which is operated through a cooperative agreement with the Institute of Public Affairs under authority of the Johnson-O'Malley Act. (Present funds will carry the program to July 1941.)

If these trainees demonstrate administrative ability, they soon pass into regular Federal employ, by meeting the usual Civil Service requirements. While this experiment has not continued long enough to yield conclusive results, it has demonstrated the feasibility of job-training for administrators. Another result of the training and testing program at Albuquerque during the past year has been a study covering about 1,000 administrative employees, principally in Oklahoma and in the Southwest. This study may result in the improvement of the existing efficiency-rating system now used in the Government. The study is also designed to test the efficacy of tests now used in recruiting new employees.

A third item of research, very important to the Indians, has been a study financed by the Public Administration Clearing House, dealing with the careers of Indians in the Indian Service. This study examines the selection of Indians for the Indian Service, their advancement in the Service, and the development of their abilities through improved in-service training. This study is nearing completion.

Other advances in Indian personnel work are the development of special examinations for the recruitment of Indian Service teachers, nurses, and extension agents, and the designation now being made at each jurisdiction of a worker who will be specialized in the procedures and problems of personnel.

COUNCILS OF FIELD ADMINISTRATORS

Significant progress was made during the past year in the organization and operations of councils composed of jurisdictional superintendents within seven important field areas. Founded in 1937, these councils have been developed in order that superintendents within a given area might share administrative experiences, exchange ideas, and enjoy the benefits of unity in common purposes and objectives. The areas in which the councils now operate are the Southwest, Intermountain, Northwest, Lake States, Dakotas, Oklahoma and Kansas, and Montana.

Such purposes are accomplished mainly by means of quarterly meetings and research studies conducted by each council group. The Southwest and Intermountain areas share the services of a full-time executive secretary, who is engaged in order that the meetings might be more productive, that technical assistance might be available for research in common administrative problems, and that the councils might have a liaison officer with the Washington office and the regional specialists. In other council areas, Indian organization field agents assist the councils during their meetings.

ARTS AND CRAFTS

Indian arts and handicrafts, long an intimate part of Indian life and culture, are also an important source of livelihood to the tribes. As a step toward fostering more profitable development of native talents, the Indian Arts and Crafts Board was established by act of Congress in the Department of the Interior in 1936 with the threefold purpose of educating the Indian craftsman in modern commercial methods, of expanding the market for Indian goods, and of protecting both the consumer and the Indian producer from cheaply imitated wares.

While the individualism of the Indian craftsman has been his principal asset in production, it has been his liability in marketing his product. Originality of design and execution give Indian arts and handicrafts their charm; but in selling his goods, the lone craftsman has been hard put to compete with the highly organized sales associations throughout the country.

One of the principal functions of the Arts and Crafts Board has been to teach the Indian modern commercial distribution methods without commercializing the product of his skill.

Preparatory to making definite recommendations to the various tribes on how their handicraft talents might best be utilized, it was necessary for the Board to survey every type of craft work still carried on among the Indian tribes of the United States and the natives of Alaska. It was imperative to know whether the various Indian prod-

ucts could be offered for sale in their traditional form, or whether they needed to be modified to satisfy the requirements of the buyers.

During the past year the findings of these surveys were crystallized in the publication of the book, *Indian Arts in North America*, by George C. Valliant, published by Harper & Bros. In its 52 pages of text and 96 plates, this book surveys North American Indian art from pre-Columbian times to recent achievements, describing concisely Indian origins and cultural differences.

The next problem was the commercial market. Last spring, contacts were made with merchandising experts and manufacturers to ascertain their reactions to quality Indian products as marketable merchandise. Articles shown included Choctaw and Cherokee fabrics, Navajo silver, moccasins and belts from the Plains Indians, ribbon-work from the Oklahoma tribes, and braided sashes from the Eastern Woodlands. The reactions of the merchandising experts were highly favorable and brought immediate orders, in spite of the fact that such orders were not solicited.

Since the volume of quality Indian products in all regions is still too small and too unstable to meet the large demands of most organized business houses, the Board could only carry back to the tribes the results of this inquiry as concrete proof of the existence of a demand and as a means of encouraging local agencies in their efforts to organize quality production.

In line with these efforts, preliminary outlines were prepared during the past year for the establishment of marketing organizations among the Navajo, Pueblo, and Seminole Indians. The Board also participated in the creation of a Community Arts and Crafts Center at Sells, Ariz., for the Papagos in southwestern Arizona. Through the use of tribal moneys and Indian Service rehabilitation funds, a building for the display and merchandising of arts and handicrafts was constructed with facilities for all retail and wholesale activities. With the assignment of a field worker to the Papago area, handicraft production is now under way in accordance with standards approved by the Board.

A second major effort of the Arts and Crafts Board has been to stimulate new outlets and new customers for Indian goods. Not only through sponsoring publications on Indian arts but also in the actual exhibit of authentic Indian goods and the demonstrations of present-day Indian techniques by Indians themselves has the Board discovered a rapidly expanding market for native craft talents.

At the Golden Gate International Exposition, San Francisco, Calif., the Board presented the largest exhibition of Indian arts and crafts ever assembled. The exhibit was made possible through the assistance of the United States Commission of the Fair, foundations, and private

individuals. The exhibit displayed the products of Alaskan culture areas and the seven principal Indian cultures in the United States: the Eastern woodsmen, the Plains tribes, the Northwestern fishermen; the California seed gatherers, the Navajo shepherds, the Pueblo farmers, and the Arizona desert tribes. In addition two model rooms were furnished entirely by Indian artisans. The complete exhibit occupied approximately an acre and a half and was seen by 1,500,000 visitors. In cooperation with a chartered Indian community of the Round Valley Reservation, Calif., a market was established for selling arts and crafts. Through the sale of their goods, Indians realized over \$16,000 during the Fair's first season, and over \$6,000 in wages for demonstrating native craft techniques.

The exhibit at San Francisco was closed October 29, 1939, to be opened again this summer. The Board's activities this year, however, were limited to the detailing of an employee to supervise the administrative work. A detailed and elaborate pictorial report of the exhibit, in the form of a microfilm, is now being prepared under a special grant from the Carnegie Corporation, New York.

The simplicity of line, strength of form, and absence of all extraneous matter in the two model Indian-decorated rooms at the San Francisco Exposition blended so naturally as an effective interior motif for modern homes that the Board was asked to prepare a similar exhibit for the Museum of Modern Art, New York City. Files of specimens and photographs have already been assembled and work undertaken on many reservations. This even larger exposition of Indian art in wood, ceramic, and textile is scheduled to open January 22, 1941.

Finally, the Board has carried forward its program of protecting buyers from spurious goods by issuing die-stamps or certificates of genuineness for all arts and handicrafts produced under conditions approved by the Board. The Government's seal of protection is available only to those Indian goods produced under conditions not resembling a workshop or factory system.

Navajo rugs, for example, have a label on a loose wire, sealed against tampering, which certifies that the rug was woven on hand looms from Navajo wool carded by hand. Silver jewelry from the Navajo and Pueblo country is die-stamped, indicating the name of the tribe which hammered and wrought the jewelry from slug silver.

During the past year, the Arts and Crafts Board has been preparing a system of trade-marks for quality products in the other less developed branches of Indian crafts. This trade-mark register will soon be available to all tribal groups who desire the protection of a Government guarantee of authenticity.

The sale of craft articles now provides a supplemental source of income for Indians, roughly estimated at about \$1,000,000 per year.

As the program advances, it is expected that Indian remuneration from arts and crafts production will increase manyfold within the next few years.

ALASKA

Alaska is a territory about one-fifth as large as the United States, with something less than 75,000 population. In this vast frontier area, a few hundred Indian Service workers and some 32,076 Eskimos and Indians are carrying forward a program of conserving the Territory's resources for future generations.

The problems of national defense have focused new interest on Alaska, for Alaska lies on the great circle route from the United States to Asia, and is an outpost of strategic importance. Here the experiences of the Indian Service may be of great value to the cause of national defense: the knowledge of terrain and climate, the existence of all-weather methods of transportation, and the amateur radio stations in outlying Indian Service posts are all assets which may serve national defense as well as they serve the cause of Indian rehabilitation.

The Indians and Eskimos subsisted on the fish and game of the northern latitudes. When commercial hunters destroyed the natives' food supply, whole villages were depopulated by starvation and disease. To insure a more reliable food supply for the northern part of Alaska, Congress in 1892 authorized the Office of Education to purchase and import reindeer for the support of the Eskimos. During the years that followed, the original 1,280 reindeer grew to almost a million head, but as they multiplied in number, they also passed from native to white ownership. Disputes arose between the original owners and the intruders over ownership, range control, and other questions inherent in the two different methods of exploitation. Under the stress of competition, the number of reindeer diminished and the range lands deteriorated, until the Eskimos were again faced with a shortage of food and skins.

In 1939, the Congress appropriated money for a census of reindeer, and allotted \$795,000 for the purchase of all reindeer not in native control. The census and round-ups were accomplished in a trimotored ski-equipped plane, assisted by native herdsman, and resulted in the acquisition of 84,001 reindeer, along with corrals and storage plants, at a figure \$275,000 less than the amount authorized.

The problem of the Indian Service now is to distribute the reindeer among the Eskimo villages on the basis of need, to teach the Eskimos scientific range management, to protect the herds from the depredations of marauding wolves increasingly prevalent in the reindeer country, and to assist in marketing byproducts not needed for native consumption.

Besides their value as food and clothing, reindeer provide the Eskimo a principal cash crop—fur clothing. During the past year, native craftsmen sold \$7,300 worth of mittens, caps, mukluks, parkas, trousers, and robes to the Byrd Antarctic Expedition. Native co-operative groups are now filling War Department orders aggregating over \$70,000 for fur clothing for the new garrisons to be stationed in Alaska.

Arts and crafts products are another important export. There are now some 120 dealers, 50 of them in the United States, handling such native products as dolls, wood carvings, ivory carvings, and baskets. Sales in 1939 totaled \$130,000, an increase of 40 percent over 1938; and 60 natives were employed as arts and crafts instructors.

Fishing is a major industry in Alaska, and although the natives along the coasts have followed fishing for hundreds of years, they too found their source of food threatened with the influx of white fishermen with their commercial methods of wholesale exploitation.

Now, however, under legislation similar to the Indian Reorganization Act, Alaskan natives may apply for charters of incorporation from the Federal Government, obtain loans for economic enterprises, and request that the Government set aside certain reserves for the exclusive use of the natives. Nine applications for this type of hunting, fishing, and grazing reserve have been received, and the Federal Government has made loans totaling \$459,650 to 12 native corporations for such purposes as establishing cooperative stores, storage plants, purchasing fishing equipment, and repairing boats.

One of the most hopeful steps toward independence and self-sufficiency has been made by the natives of Hydaburg, who built their own salmon cannery in 1939. During the first year of operation, natives caught and canned 41,236 cases of salmon and sales to date indicate they will easily meet their credit obligations. The cannery is managed by a nonnative, but the native owners expect to operate it themselves as soon as they are experienced enough.

Other native enterprises include the drying, smoking, and salting of fish at Elim and Unalakleet where outside markets have been located for disposal of local surpluses; the development of coal deposits at Point Hope and Unalakleet for local needs; and the conservation of wood at Shaktoolik and Stebbins for winter fuel.

TEACHERS HELP IN CENSUS-TAKING

In the task of enumerating the natives among Alaska's rugged, almost impassable mountains, rivers, and islands, the Bureau of the Census relied heavily on the assistance of Indian Service teachers and

field nurses. The Indian Service's operations bring it into contact with most of the native population the year round. Only an estimated 30 to 50 small native villages located in the most inaccessible regions, and which are impermanent in character, having a population of from 12 to 75 inhabitants, are without the services of the Office of Indian Affairs. Most of the teachers were thus able to assist in the census-taking along with their regular duties.

Indians and Eskimos reported in the 1930 census numbered 29,983. Preliminary tabulations place the present number at 32,076 on the basis of incomplete census returns. The natives are being classified into six linguistic groups: Aleutian, Eskimauan, Athapascan (including Dene, Timme, and Tinneh), Haidan, Tlingit, and Tsimshian; and three racial groups: Aleut, Eskimo, and Indian.

Aside from the decennial census, Indian Service teachers constantly perform many tasks outside the classroom, as they are often the only persons in the native community qualified to read English, interpret Government reports, and record data. A willingness for personal sacrifice, versatility, respect for the natives, and courage to meet the rigors of isolated climes are among the desired qualifications in the Alaska Service.

As the entire program of the Indian Service in the sparsely settled areas may revolve around a single Government employee, such as the teacher, four summer schools have been held during the past six years to study improvements in administration and clarify the problems of the particular Alaska communities in the light of the Federal program. In the summer schools, the Indian Service employee receives specialized training and demonstrations in the work of the Indian Service and related or cooperating agencies. The three R's can hardly be considered adequate training for assisting the natives toward self-dependence: the Alaska Service employee must take local responsibility for adapting the Indian program to his particular jurisdiction. This may entail setting up native governments to direct local affairs; borrowing funds for economic enterprises; stimulating the production and marketing of arts and crafts articles; demonstrating simple hygienic practices to improve health and living conditions; maintaining contact with other Federal agencies and the outside world; and supervising gardening, domestic relations, relief to the needy, recreation, cooperative store management, and the use of reindeer and other resources.

An increasingly important activity for teachers as well as other Alaska Indian Service employees, particularly in connection with the census-taking and reindeer round-ups, was the maintaining of daily radio communication; and, as part of their work, reporting

weather and landing conditions for the information of airplane pilots. Through special permission granted the Office of Indian Affairs in 1937 by the Interdepartmental Radio Advisory Committee, radio stations may be established in Indian Service schools and hospitals, without the issuance of licenses, for communication with each other and administrative headquarters through the Signal Corps System. Although the teacher must purchase and install at his own personal expense the radio equipment necessary for such a station, 42 stations have already been authorized to operate as Indian Service stations. These communication facilities are making the Alaska Indian Service more efficient and economical in saving lives and preventing accidents.

The Indian Service had in operation 115 small day schools, two boarding schools, and eight small hospitals. School facilities have yet to be provided for a third of the Indian and Eskimo population of Alaska.

Expansion of the educational and health facilities is underway with the construction of 4 new small community day schools, two 32-bed hospitals at Kanakanak and at Tanana, and accommodations for a dispensary and nurse's or physician's quarters at Nulato, Klawock, Tetlin, and Hydaburg.

In Alaska, as elsewhere in the Indian Service, natives receive preference in employment, and those having the necessary training are rapidly promoted and given permanent positions as soon as vacancies occur. Among the 205 teachers and 73 special assistants on the educational staff last year were 1 native principal, 27 native teachers, 10 apprentice teachers, and 13 native special assistants.

In all building, native labor is employed wherever possible with only a minimum of white labor.

Tuberculosis is still the most serious disease among the natives, and there is urgent need for establishment of a large tuberculosis sanatorium. Out of a total of less than 200 beds in the present eight Federal hospitals, only 32 beds are reserved for tuberculous patients. In addition to a sanatorium, new hospitals are needed particularly at Ketchikan, Seward, and in the Norton Sound region.

CIVILIAN CONSERVATION CORPS

Conrad L. Wirth, *Representative, Department of the Interior Advisory Council, Civilian Conservation Corps*

SIX bureaus of the Department of the Interior charged with responsibility for the protection of resources vital to the strength and defense of the Nation gave supervision during the year to Civilian Conservation Corps projects for the conservation of these resources and their development for the national welfare. In so doing they also contributed to the general program of rehabilitation and training of the young men enrolled in the C. C. C. An average of 485 camps operated under the Department during the year.

GENERAL LAND OFFICE CAMPS

Five camps assigned to the General Land Office worked under supervision of the Oregon and California Administration on projects for proper execution of the sustained yield forestry management of approximately 2,500,000 acres of revested Oregon-California Railroad grant lands in western Oregon. Conservation of the forest resources of these lands through fire protection and reforestation was a principal objective, while the corps also helped in efficient utilization of these resources. The whole sustained yield program in this area will be advanced through a C. C. C. road construction program making a large percentage of the area accessible, thus permitting the sale and removal of older and fire-killed timber to satisfy the demands of industry while leaving the younger and more thrifty growth to reach maturity and proper merchantable size.

Control of outcrop fires in valuable Federal coal deposits in Wyoming was continued under the supervision of the General Land Office in the Little Thunder Basin region. During the year, 13 separate coal bed fires were worked upon, 6 of which had been worked on previously. Three of these projects were definitely completed and work is progressing satisfactorily on the others. One fire of recent origin was taken out completely in 16 working days. There remain several other coal bed fires near Gillette upon which work must be done to prevent the destruction of this irreplaceable natural resource.

The operation of these General Land Office C. C. C. camps is

financially sound, because the cost of the camps will be returned many times to the Nation's wealth through increased protection, more efficient utilization, increased stumpage values, and conservation of forest values.

INDIAN C. C. C. PROGRAM

No section of the American people has received greater or more direct benefits from the C. C. C. program than the Indians. This program, in which thousands of them have been cooperating under the Office of Indian Affairs, has been one of conservation and protection of their own homelands on 71 reservations. Wages earned have provided Indians with current necessities of life and means for improving home conditions. The quality and standard of their work have improved. Safety and health have been emphasized both on the job and in the home. The C. C. C. has improved the mental attitude and physical condition of thousands of Indians who have had something to do and have given a fair day's work for a fair day's pay.

Basic structures for conservation of land and water and preservation of such resources as timber stands and forage cover have been undertaken under the C. C. C. program on the reservations. Water holes have been improved on Indian cattle ranges. Many dams constructed furnish water for livestock, refuges for fish, waterfowl, and animals; irrigation for subsistence gardens; and recreation. Ranges have been fenced. Much erosion has been prevented. New lookout towers, trails, and telephone lines have been built for the protection of resources from fire.

C. C. C. training among Indians has built up an important "second line" for national defense. For instance, more than 1,000 pieces of heavy mechanized equipment are operated and kept in repair by enrollees. More than 1,500 other automotive machines, trucks, cars, trailers, motor patrols, etc., are in continuous service on the projects. The Indians have built and are maintaining 7,000 miles of telephone lines. More than 8,000 miles of truck trails have been built and are being maintained, and more than 1,000 bridges have been constructed, involving important engineering training. A full program of first-aid instruction is being carried out. Experience in camp administration has been gained in the operation of 25 camps which house and board Indian C. C. C. enrollees.

Work in Reclamation

Valuable assistance in the program of the Bureau of Reclamation for the irrigation of millions of acres of western lands for agricultural use was given by the 44 camps allotted to this agency. Rehabilitation

of the distribution system of older reclamation projects continued to be the principal C. C. C. activity, although a large portion of enrollee time is being devoted to work related to the development of new areas and to experimental programs seeking to improve the conservation of water for irrigation purposes.

Most of the work on reclamation projects is of a construction nature, affording valuable training for the enrollees. Projects involve the building of many concrete water-control structures, lining of canals, clearing of reservoir sites, etc., requiring the operation of a fleet of trucks, tractors, scrapers, compressors, and similar mechanized equipment. The number of pieces of heavy equipment assigned to each reclamation camp is the second largest per camp assignment in the Department of the Interior. Operation and maintenance of this equipment under the difficult field conditions encountered on many reclamation projects and in coordination with the regular work programs is providing an unusual opportunity for the specialized training of hundreds of enrollees in a type of work fundamental to national defense.

An outstanding C. C. C. achievement of the year under Bureau of Reclamation supervision was completion of the Duchesne feeder canal diversion dam and headworks on the Moon Lake project in northern Utah. Another completed project included the raising of Clear Lake Dam on the Klamath project in Oregon. The Hackberry Draw flood-control project on the Carlsbad project in New Mexico, also was finished. Another accomplishment was the construction of the Elephant Butte fish hatchery on the Rio Grande Federal reclamation project in southern New Mexico. This project will be of great recreational value by providing fishing in a section remote from natural fishing areas. Other recreational areas developed during the year include those at Walcott Park at Minidoka Dam in southern Idaho; Alcova Reservoir on the Kendrick project in central Wyoming; and the Nelson Reservoir on the Milk River project in northern Montana.

Several heavy construction jobs were completed by the enrollees during the year, such as the building of the Alkali Creek inclined drop on the Shoshone project in Wyoming, involving production of 1,800 cubic yards of 6-inch concrete lining and 1,900 linear feet of 6-inch vitrified tile. On the Heart Mountain Canal on this same project, four large timber bridges were completed on the new operating road.

ACTIVITIES IN NATIONAL PARKS

During the fiscal year 90 camps were maintained in national parks and monuments, 198 in State, county, and metropolitan parks, and 22 on Federal recreational demonstration areas. Since the inception of

the C. C. C. there have been 198 camps established in 94 national park and monument areas in the continental United States, and 697 in 881 State, county, and metropolitan areas. In supervising this work the National Park Service has cooperated with 47 States, 35 counties, and 73 municipalities.

Camps were established for the first time in Badlands (S. Dak.) and Chaco Canyon (N. Mex.) National Monuments, Saratoga (N. Y.) National Historical Park project, and Kings Canyon (Calif.) National Park. Important historical restoration projects were carried on at Fort Pulaski (Ga.) and Bandelier (N. Mex.) National Monuments, Acadia (Maine) National Park, Shiloh (Miss.) National Military Park, and Colonial National Historical Park, Va.

Locations and plans for fire lookout towers were approved for seven National Park Service areas, and those in Shenandoah (Va.), Great Smoky Mountains (Tenn.), and Mesa Verde (Colo.) National Parks were completed. Preservation of archeological features and additional archeological reconnaissance work were continued at Ocmulgee (Ga.) National Monument.

Work accomplishments in areas of the national park system during the year included construction of 112.4 miles of fire breaks, tree and plant disease control work on 18,670.3 acres, the building of 72.1 miles of truck trails and minor roads, and 1,806 check dams. A total of 34,812 enrollee man-days was spent on 12,697 acres in the national parks of California for eradication of ribes for white pine blister rust control.

TRAINING IMPORTANT FEATURE

Enrollee training has been an important part of the C. C. C. program under National Park Service direction. During the year 95 percent of the technical personnel participated in both on and off the job training of enrollees, involving approximately 170,000 instructor-hours and 1,600,000 enrollee-hours. The fact that nearly 5,000 enrollees, most of whom possessed no special skills prior to joining the C. C. C., found jobs in private industry is largely due to this training.

Much importance was placed upon accident-prevention methods in the operation of trucks and other mechanical equipment, with a resultant reduction of 13 percent in the number of lost time and fatal accidents compared with the 1939 fiscal year, and nearly 18 percent reduction in the severity rate for the same period. Special emphasis was placed upon forest-fire protection by teaching the enrollee proper conservation practices, the proper handling and inspection of fire tools and equipment, and safe practices on the fire line.

NONFEDERAL AREAS BENEFITED

Camps were established on several non-Federal areas for the first time. Work on State, county, and metropolitan parks included projects for roads, picnic areas, and campgrounds, and facilities for swimming, hiking, camping, and similar activities. Important projects were also carried out for the protection and comfort of park visitors, such as water and sanitation systems, service and administration buildings, telephone lines, parking areas, fences, and guard rails. Historical preservation and restoration was also a feature of non-Federal area work.

Construction of a 200-foot log truss suspension bridge over the Spokane River was one of the outstanding C. C. C. jobs at Riverside State Park, Washington. In Watkins Glen State Park, New York, a smaller but equally useful bridge was built, in addition to fireplaces and picnic-ground development. Fifteen acres of beach were improved at Provo River Metropolitan Park in Utah and a vehicular bridge completed in the same area.

An archery range was built by enrollees in Brown County State Park, Indiana, where recreational use increased tremendously as a result of C. C. C.-built facilities.

To meet the increasing popularity of horseback riding, the Corps developed horse trails in 31 State, county, and metropolitan parks during the year. Outstanding were such projects in Moran State Park, Washington; the Akron Metropolitan Park system in Ohio; Clarence Fahnestock Memorial State Park, New York; and Cook County Forest Preserve District system, Illinois.

Four miles of entrance road and a 3-acre tent site were completed in Westmoreland State Park, Virginia. The Robert Fechner Recreation Area in Georgia, named for the first Director of the C. C. C., now deceased, was improved by the development of picnic grounds and shelters.

The C. C. C. contributed substantially to the continued development of Federal Recreational Demonstration Areas. Camps assigned to 22 of these areas worked on construction of buildings, utilities, roads, trails, swimming facilities, dams, and other projects for the safety and convenience of users.

IN THE TERRITORIES

In Territorial work, 675 enrollees were assigned to 5 projects in Hawaii, 225 additional enrollees were at work in Hawaii National Park, and 500 were assigned to jobs in the Virgin Islands. In addition, a 200-man company was at work in Mount McKinley National

Park, Alaska, during the summer of 1939. Territorial camps in Hawaii carried out tree planting and tree nursery work, as well as development of an experimental bird and game farm. In Hawaii National Park they constructed an underground telephone system and worked on planting and landscaping, removal of exotic plants, and erosion control. In the Virgin Islands, work included construction of minor roads, parking areas, fences, picnic areas, and telephone lines. Fire hazard reduction and field planting were also important projects, as well as eradication and control of undesirable animals. Good progress was made in landscaping of the service area and construction of necessary water and telephone lines and buildings at Mount McKinley National Park.

RANGE REHABILITATION ADVANCED

Excellent progress in a joint program for the rehabilitation of youth and the public range is reported by the Grazing Service. Construction and preventive programs designed to facilitate the control and use of lands under this Service were carried out in Utah, Nevada, California, Oregon, Idaho, Montana, New Mexico, Colorado, Arizona, and Wyoming.

Stock users generally acclaim the benefits derived from such physical improvements as wells, springs, fencing, corrals, truck and stock trails, and correlated activities which contribute to the conservation and preservation of forage coverage, such as rodent and fire control, and reclaiming measures such as erosion and flood control and watershed protection. Minor roads, trucks and stock trails, and water-storage improvements constructed primarily for stock purposes also can serve, with a little additional work on them, to facilitate travel in much of this semiarid area.

COOPERATE IN WILDLIFE CONSERVATION

Under supervision of the Biological Survey (which became the Fish and Wildlife Service on July 1, 1940) an average of 35 camps worked in 27 States from Maine to California and from North Dakota to Louisiana.

Development programs vary at each wildlife refuge, because of differences in water supply, climate, rainfall, and topography, although in the main the work was a continuation of previous activities. Projects included the construction of dams, dikes, levees, ditches, and other water-control structures, nesting islands, wildlife shelters, truck trails, bridges, lookout towers, fire lanes, telephone lines, headquarters, laboratories, and utility buildings, fences, and boundary markers; the planting of marsh and aquatic vegetation and of trees, shrubs,

vines, and soil-binding grasses; and other biological or engineering work necessary for the restoration, development, and efficient management of refuge areas. All such areas have been much improved and many have been transformed from biological deserts to refuges of great attractiveness to wildlife.

Of special importance was the work done on the Savannah River Refuge in South Carolina where the Corps began work in 1935. By the close of the 1940 fiscal year they had created 3,385 acres of excellent duck ponds with permanent dykes and control structures insuring stable water levels necessary for the abundant growth of food and cover. Refuge patrol has been facilitated by the erection of fences and boundary markers and the construction of roads and trails.

DIVISION OF TERRITORIES AND ISLAND POSSESSIONS

Rupert Emerson, *Director*

THE war in Europe and the continuance of the conflict between Japan and China brought an expansion of administrative activities by the Division of Territories and Island Possessions during the past fiscal year. With national attention focused upon all the Territories and possessions as points of vital strategic importance for the defense of these areas and of the continental United States, the Division cooperated fully with other Government agencies in providing facilities for such defense.

Alaska particularly has loomed as a potential point of invasion by air; as a consequence, the Division assisted in steps to provide protective Army and Navy bases which are being rushed to completion at various strategic points in the Territory.

Of particular significance to the defense of Alaska is the proposed legislation (S. 3577) strongly recommended by the Department of the Interior, which would make possible the organization of limited-dividend corporations to develop and colonize this sparsely settled Territory whose population averages only about one person to each 10 square miles. The proposed colonization program would provide a "defense behind the defense" in the form of manpower, in the case of actual combat, and an active population to furnish needed supplies to the regular troops which will be stationed in Alaska in connection with the new bases.

The Division also participated in coordinated plans for strengthening the military defenses of Puerto Rico, one of the bulwarks of protection for the Panama Canal, the establishment of a submarine base at the Virgin Islands as another link in the chain of Caribbean defenses, and the augmenting of preparedness measures in Hawaii, base of operations of the Pacific fleet.

During the year the Division continued its administrative functions of coordinating the Federal activities relating to Alaska, Hawaii, the Philippines, Puerto Rico, and the Virgin Islands; also the Alaska Railroad; Alaska Road Commission, the economic and social program of the Virgin Islands Co., and the colonization projects on Jarvis, Baker, Howland, Canton, and Enderbury Islands in the Pacific Ocean.



UNCLE SAM'S OUTPOST IN THE CARIBBEAN.

View of the harbor from Government Hill, St. Thomas, Virgin Islands, one of the far-flung portions of the United States under the jurisdiction of the Division of Territories and Island Possessions.

Rupert Emerson took office as Director of the Division of Territories and Island Possessions on June 24, 1940, succeeding Dr. Ernest Gruening, who was appointed and took over the duties of the Governor of Alaska, December 5, 1939.

ANTARCTIC SERVICE EXPEDITION

Considerable interest was aroused throughout the United States when the United States Antarctic Service Expedition sailed from Philadelphia on November 23, 1939. Prior to that time considerable work and effort was necessary not only by this Division but by other bureaus of this and other departments in order to assemble the necessary supplies and scientific equipment, and to assign personnel for the expedition. After some delay due to rigorous weather conditions in the south polar regions, two camps were established, one with 33 men at the West Base in January and the other with 26 at East Base in March 1940. The personnel at these bases will be engaged in many scientific observations, and, with weather permitting, in air-mapping large areas hitherto unexplored.

At the time the expedition was planned it was intended that the base camps would be maintained for at least a 2-year period in order to obtain the greatest amount of data possible. The Congress, however, appropriated only sufficient funds for the present fiscal year to evacuate the base.

TERRITORY OF ALASKA

During the year John W. Troy resigned as Governor of Alaska and was succeeded by Ernest Gruening, former Director of the Division of Territories and Island Possessions, who took the oath of office on December 5, 1939.

The 1940 census indicates an increase in population for the Territory from 59,278 in 1930 to perhaps 73,000 in 1940, an increase of over 23 percent.

At present the economy of Alaska rests largely on two industries, mining and fishing. Fishing is highly seasonal—for a few weeks each year—and its expansion is definitely limited by the need of conservation. Mining, too, rests preponderantly on one metal—gold. If the Territory's economy is to be securely maintained and grow, new activities and industries need to be developed.

One of the most obvious economic resources to be developed in Alaska is the recreational industry. Alaska is just beginning to appreciate the possibilities of this field and to think in terms of suitable accommodations for tourists and adequate facilities for their transportation.

Travel to the Territory increased considerably during the past year. Records of the 5 regular steamship companies serving Alaska show that 22 passenger ships and nine freighters carried 75,269 passengers in 1940 as compared with 68,065 the previous year. These figures do not include passengers transported by Government vessels during that time, or by vessels of the fishing interests operated during the canning season.

The principal revenue-producing industry, the fisheries, showed a decrease of \$7,450,534 in production for the year from that of the previous year. Poor packs of pink salmon in southeastern Alaska and in Prince William Sound were responsible for the sharp decrease in value from \$37,190,961 to \$29,740,427.

Mines in Alaska produced minerals worth \$25,296,000 in 1939, as against \$28,607,000 in 1938. The figure for 1939 is used instead of 1940 because records pertaining to mining activities are maintained on a calendar-year basis and the 1940 production figures will not be available until the end of December 1940. The following table shows the value of the mineral output of Alaska for 1938 and 1939.

	1939	1938
Gold.....	\$23, 279, 000	\$23, 170, 000
Silver.....	138, 000	307, 000
Copper.....	30, 000	2, 976, 000
Lead.....	106, 000	105, 400
Platinum metals.....	997, 000	1, 229, 300
Tin, metallic.....	37, 300	89, 100
Coal.....	585, 000	620, 900
Miscellaneous mineral products, including antimony, limestone, quick-silver, etc.....	123, 700	109, 300
Total.....	25, 296, 000	28, 607, 000

It will be noted that gold leads all other minerals in value. The value of the gold produced in 1939 was greater than in any other year in the entire history of the Territory.

A noteworthy advance was recorded in the value of fur skins from Alaska, being about a quarter of a million dollars more than the preceding year. The figure for the year was \$2,844,262.

Total shipments from Alaska to the United States declined by almost \$9,000,000 from the previous year, and shipments to the Territory by less than \$1,000,000.

The financial condition of the Territorial treasury is indicated in the following statement:

Net cash balance on hand, Jan. 1, 1939.....	\$877, 112. 82
Receipts.....	2, 845, 453. 68
Disbursements.....	3, 065, 880. 68
Net cash balance, Dec. 31, 1939.....	656, 685. 82

Aggregate banking figures for both national and territorial banks on June 30, 1940, were as follows: Capital, \$910,000; surplus and net undivided profits, \$1,250,339; deposits, \$17,148,552. Deposits show an increase of \$567,992 over the previous year.

THE ALASKA RAILROAD

The passenger train schedule of the Alaska Railroad in effect during the summer of 1939 provided for three round trips per week between Seward and Fairbanks, with supplementary service out of Fairbanks to Nenana and Mount McKinley National Park.

Passenger train service was reduced to one round trip each week in September, which schedule remained in effect until March 26, 1940, when one additional train was put on. On June 9, 1940, the summer passenger train schedule was again inaugurated consisting of three round trips per week between Seward and Curry; four round trips per week between Curry and Fairbanks with supplementary service out of Fairbanks to Nenana and Mount McKinley National Park, and out of Seward to Anchorage.

River boat service was maintained during the season of river navigation with biweekly sailings from Nenana to Tanana, Ruby, Holy Cross, and Marshall.

The number of rail line passengers carried amounted to 29,510 with a passenger revenue of \$264,715. Rail line freight hauled totaled 194,467 tons, with a freight revenue of \$2,311,152. The freight tonnage included 113,980 tons of coal. The total rail and river operating revenues were \$3,058,055; operating expenses were \$2,712,628. The total income in excess of expense amounted to \$341,663.

A new material warehouse was constructed at Anchorage replacing the warehouse lost by fire last year. Improvements and rehabilitation of track, bridges, and buildings continued throughout the year.

THE ALASKA ROAD COMMISSION

The work accomplished by the Alaska Road Commission during the fiscal year is summarized as follows:

New construction.—More than 19 miles of road, of which 11½ miles were surfaced, 53 miles of sled road, 360 linear feet of steel bridges of 60-foot span or over, 160 linear feet of steel trestle span bridges, 711 linear feet of timber trestle bridges and one 60-foot timber truss span.

Improvement.—A total of 47 miles of road regraded and widened, 121½ miles of road surfaced, 479 metal culverts averaging 20 feet in length installed principally as replacements for wooden culverts.

Maintenance.—More than 1,932 miles of road, 139¼ miles of tramway, 639¼ miles of sled road, 2,637 miles of permanent trail, and 240 miles of temporary flagged trail.

The cost during the year was \$944,822 of which \$240,766 was for new work and \$704,056 for maintenance and improvement.

ALASKA INSANE

During the past year 59 persons were admitted to Morningside Hospital at Portland, Oregon, where the legally adjudged insane from the Territory are cared for under contract with the Department of the Interior. During the same period there were 55 separations, leaving a net total increase in patient population at the end of the year of four patients. There was a total of 309 patients under care at the end of June, of whom 241 were males and 68 females.

TERRITORY OF HAWAII

Preliminary figures compiled by the Federal Census Bureau show that the population of the Territory was 422,860 on April 1, representing a 12.9-percent increase in the past decade. The Board of Health reported a decreasing death rate and an increasing birth rate during the year as compared to the previous year.

On adjournment of the 1939 legislature, it appeared likely a large deficit would ensue for the biennium on June 30, 1940, on the basis of estimated revenues and total legislative appropriations. However, tax collections during the year showed an excess over estimates, the result of improved business conditions. The Auditor reported that available cash on June 30, 1940, was \$2,956,294.74.

Total deposits in the 7 banks of Hawaii showed an increase of 9.7 percent for the year, while the gross assessed value of real and personal property in 1940 shows an increase of 3.747 percent.

Commerce figures continue to show a favorable balance for the Islands. Of the total amount of \$224,392,287 for the calendar year 1939, \$101,817,230 represented the value of shipments from the mainland United States to Hawaii, while \$113,206,898 represented shipments from Hawaii to the mainland. Imports from foreign countries were valued at \$7,479,248, while exports to foreign countries from Hawaii were worth \$1,888,911.

Sugar remained the primary industry of the Territory as far as valuation is concerned, shipments to the mainland having been valued at \$55,217,960, consisting of \$53,973,169 worth of raw and \$1,244,791 worth of refined sugar. Total value of pineapple shipments to the mainland was \$50,822,533 consisting of \$34,098,779 worth of canned pineapples and \$16,723,754 worth of pineapple

juice. Total value of pineapple exports to foreign countries was \$824,540, representing \$616,119 in canned pineapple and \$208,421 in pineapple juice.

Federal funds contributed considerably to the economy of the islands. Work Projects Administration activities in Hawaii during the year involved aggregate expenditures of \$1,972,641.39, and furnished an average monthly employment for 1,748 individuals. Expenditures of Federal funds for the operations of non-Federal projects amounted to \$433,298.54 of which \$405,809.34 was for labor and \$27,489.20 for materials, equipment rentals and other nonpersonal items. Work Projects Administration funds allotted to the Army and Navy Federal projects for the year amounted to \$564,159.98 and \$186,389.10, respectively, making a total expenditure of Federal funds in the Territory of \$1,183,856.62. In addition, sponsors contributed \$788,784.77 for labor, materials, equipment rental, making a grand total expenditure of \$1,972,641.39 for the W. P. A.-operated projects.

Total benefits of \$9,099,832 were paid to farmers in Hawaii for compliance with various conditions of the Agricultural Adjustment Administration. Under the Sugar Act of 1937, payments to 2,068 growers of sugarcane totaled \$8,975,614, which represented an increase of \$381,614 over the payments made in 1939, the increase being due to a larger production of sugar. Benefit payments to farmers under the soil conservation program amounted to \$121,404 and payments to rice growers were \$2,814.

Tourist travel to Hawaii established a new peak with 24,390 visitors in the calendar year 1939, in addition to 41,041 one-day tourists—through passengers en route to points beyond Hawaii—bringing the total of all arrivals, first and cabin classes, to 65,431. This showing was made notwithstanding the fact that travel to Hawaii was handicapped during the latter part of 1939 by a strike that closed the port of San Francisco and by the withdrawal from service of a number of foreign-flag liners.

A total of 90 Federal Credit Unions, with aggregate assets of \$2,069,679 were operating in Hawaii at the end of the 1939 calendar year and had made 47,170 loans to 14,210 borrowers totaling \$5,777,296. Loan losses of all unions since their inception in the fall of 1936 amounted to only \$1,385.21, or 0.024 percent of the entire amount loaned. The average share savings per member was \$67.63, while the average loan outstanding was \$124.

PUERTO RICO

The finances of the Insular Government continued in a satisfactory condition. The general fund, commonly termed "insular revenues,"

represents the collection of taxes and other receivables which, according to law, are available for the current operations of the Government. At the close of the year, the general fund showed a balance of \$2,853,331.75. This surplus resulted in large part from greater receipts than were anticipated from improved business conditions, the production and shipment of alcoholic beverages, and careful attention to disbursements in order that a program of reasonable economy might be followed.

Exports to the continental United States and to foreign countries amounted to \$90,902,156 and \$1,445,086, respectively, or a total of \$92,347,242. Imports from the United States and foreign countries amounted to \$100,517,184 and \$6,513,298, respectively, or a total of \$107,030,482. From these statistics there is an apparent adverse trade balance of some \$14,683,240 against Puerto Rico, but this is more than offset by importations made under the national defense program and of other Federal agencies, like the Work Projects Administration, by sugar and other agricultural payments made by the United States Department of Agriculture.

Although business conditions improved during the year there is still much unemployment due in part to the quota on sugar, the principal agricultural product of the island, and to the closing of needlework factories as a result of the Wages and Hours law enacted in 1938. The sugar quotas were suspended by Executive order on September 11, 1939, and this action was of great benefit to the sugar industry, as all of the Island's surplus sugar was exported before the quotas were reestablished. An amendment was obtained to the Fair Labor Standards Act (Public No. 88, 76th Cong., approved June 26, 1940) providing for the appointment of industries committees to recommend the minimum rate or rates of wages to be paid in Puerto Rico. A committee has been appointed to investigate conditions pertaining to the needlework industry and it is hoped that it may be found feasible to establish a rate of pay which will not compete with wages in the continental United States, but which will permit a resumption of that industry, and the reemployment of the thousands of Puerto Ricans thrown out of work by the passage of the Fair Labor Standards Act.

Preliminary census figures indicate that the total population is now 1,871,438. This is an increase of 21.07 percent in the population during the past 10 years.

Considerable progress, under the provisions of Public Resolution No. 60, Seventy-fourth Congress, approved August 27, 1935, has been made in adjusting the hurricane relief loans made by the former Puerto Rican Hurricane Relief Commission from 1929 to 1933, inclusive. Loans adjusted to June 30 number 222. The total sum accepted

in adjustment was \$295,752.52. Approximately 29.69 percent of these original loans will be recovered. These adjustments entail a great deal of work, as they are approved on the basis of the ability of the borrower to pay, and not on a horizontal reduction scale.

William D. Leahy, a retired Admiral of the Navy, succeeded Maj. Gen. Blanton Winship as Governor of Puerto Rico on September 11, 1939. The President also appointed Guy J. Swope as auditor and George A. Malcolm as attorney general. They qualified for their respective offices on November 27, 1939, and February 7, 1940.

VIRGIN ISLANDS

The outbreak of the present European War presaged evil for the Virgin Islands, especially the Island of St. Thomas. One of the chief sources of revenue for the city of Charlotte Amalie is derived from the sale of commodities of various kinds to the many tourists visiting the islands. Ships of foreign registry had many cruises scheduled for St. Thomas, but these were canceled at the outbreak of the war. The effect of the war on the Virgin Islands' tourist trade was brought into sharp focus with the sinking of the *Athenia* in September 1939, as that ship was among those scheduled for several trips to the Islands.

However, the loss in tourist revenue from foreign ships has been partially compensated for by scheduled cruises of ships of United States registry, especially the new liner *S. S. America*.

The Virgin Islands Cooperative conducts a thriving business as each ship calls at Charlotte Amalie. As an example, the *S. S. America*, has been bringing into the port on each cruise between eight and nine hundred visitors whose average expenditures total slightly over \$1 per person, or approximately \$1,000 of trade for a single day's stop.

During the greater part of the year, there was marked unemployment in the islands. This situation was relieved in St. Thomas by the initiation of projects in connection with national defense. Funds have been made available for the preparation of a submarine base and enlargement of the marine air base facilities on the Island of St. Thomas. There is also under consideration a proposed air landing field for use of the army on the Island of St. Croix.

The general agricultural economy of the island of St. Croix, however, has been at a low ebb for the past three years due to a severe drought, which continued during 1940. As most of the revenue for the farmers on the Island of St. Croix, and in fact practically the entire population, is derived from the sale of sugar cane, the effects of the continued drought are especially disastrous.

Federal funds to the extent of approximately \$400,000 from appropriations made to the Work Projects Administration were made avail-

able to the Islands in 1940, for a large variety of projects, including highway and street improvements, preparation of lunches for school children, improvements to sanitary and water facilities, eradication of cattle ticks, etc. One project of importance to the Islands provided for a survey of the population for leprosy.

A total of \$240,000 in Public Works funds was made available for the construction of an abattoir on the Island of St. Croix, as an aid to the cattle industry, and for the construction of a public market in Charlotte Amalie.

THE VIRGIN ISLANDS CO.

That the activities of the Virgin Islands Co., cover a wide variety of endeavors is evidenced by the following: it grows and buys sugar cane for the manufacture of raw sugar and sells this sugar to United States refineries; it manufactures and sells "Government House Rum" for sale in the United States, Hawaii, Alaska, and the Virgin Islands; it manufactures and sells a special distillate to a concern in St. Thomas for the making of bitters; it has a poultry farm and sells chickens and eggs in St. Croix and St. Thomas; it crushes rock and sells this to the Government for the construction of St. Croix roads; it rents tractors, farm equipment, land, trucks, and other equipment to the people of St. Croix; it sells cane seed; it does general repair work at its machine shops; and it sells cattle and milk. It sells alcohol to the Government hospitals. It transacts business with the Federal homesteaders and the Federal Homestead Authority.

Raw sugar represents about 60 percent of St. Croix's exports and the sugar quota for the Island established by the Sugar Act of 1937 amounts to only thirteen ten-thousandths of the United States consumption. Rum makes up about 35 percent of the Island's exports; and this same rum is estimated to be less than 4 percent of the United States' consumption. In other words, raw sugar and rum together represent close to 100 percent of the exports from St. Croix, and these same articles are almost unnoticed in the United States consumption.

The raw-sugar business is the only business to which people can look for employment, and the internal revenue tax on rum is the only income the municipal government (St. Croix and St. Thomas and St. John) might secure to balance its budget without continually and annually appealing to Congress for deficit appropriations as is the present practice.

The Virgin Islands Co. has in four years made the following important contributions to St. Croix economic rehabilitation:

1. Employed directly 1,000 persons, which is 20 percent of the Island's laborers. This indirectly has given employment to about 15 percent more of the Island's laborers.
2. Improved the laborers' pay, housing facilities, sanitation, provision gardens, and community centers.
3. Reestablished bankrupt properties and put them to economic use to create commerce in sugar and rum and pay about \$35,000 per year in taxes to the local government.
4. Furnished a steady market for 700 small growers and federal homesteaders with mill capacity to take care of more than four times as much cane as they can grow.
5. Reestablished a rum business which pays \$136,000 per year in internal-revenue taxes.
6. Rents modern tractors and farm equipment and sells the best varieties of cane seed to the small grower.
7. Brought a new manufacturing business to St. Thomas by contract.

The progress of the Virgin Islands Co. in reestablishing a sugar-cane and sugar-cane-products industry is indicated by the following analysis of sales:

Gross Sales and Miscellaneous Income for Year Ended June 30

	1935	1936	1937	1938	1939
Raw sugar.....			\$101,820.16	\$195,335.60	¹ \$75,607.01
Government House Rum.....	\$954.81	\$8,609.50	92,984.71	106,351.13	88,436.66
Special distillate.....			1,532.58	11,435.74	14,364.71
Tomatoes.....	170.79	2,624.12	4,979.65		
Other income.....	1,797.60	42,386.15	20,372.30	31,375.70	23,350.47
Total.....	2,923.20	53,619.77	221,689.40	344,498.17	201,758.85

¹ The severe drought of 1939 became worse in 1940. Many fields of sugarcane have died and are still dying.

The Island of St. Croix is the largest of the Virgin Islands group and its 15,000 inhabitants depend almost entirely upon the cultivation of sugarcane and the processing of raw sugar and rum for a livelihood. The cotton business was wiped out by the pink bollworm. Ventures in tomatoes, citrus fruits, sisal, tobacco, cocoa, coffee, and onions proved to be without economic success and were discontinued. However, the cattle business and the rum industry have survived and seemingly have permanent places in the economic structure. The 939 growers of sugarcane come under the restrictive provisions of the Sugar Act of 1937 which subject their sugar to the quota and processing taxes, but Congress did not extend the benefit-payment provisions of the act as an offset. Unlike growers in Hawaii, Florida, Puerto Rico, Louisiana, and the other sugar areas, the St. Croix grower is the only one

under the American flag so discriminated against. In addition, he pays an export tax of \$6 per ton on all the raw sugar shipped to the United States and is the only American citizen required to pay a tax on goods for interstate commerce as the wages and hours legislation which was extended to the Virgin Islands defines these sugar shipments.

It is essential that remedial legislation be enacted by the Congress to (1) make it possible for the grower of sugarcane to earn a living by his own labor and gradually replace the hundreds who are now on the relief rolls, and (2) make available to the treasury of the Virgin Islands the revenues from the internal revenue taxes collected on articles of Virgin Islands manufacture. This latter legislation would enable the island legislators for the municipality of St. Croix and the municipality of St. Thomas and St. John to derive revenue from the growth and products of their own communities, for the costs of their schools, hospitals, institutions, sanitation, and police, as other island possessions have been authorized to do. It would at the same time end the unworkable system of municipal deficit appropriations which have been made annually by the Congress ever since the United States Government acquired the Virgin Islands in 1917.

THE PHILIPPINE ISLANDS

Following the resignation of Paul V. McNutt, the President on August 2, 1939, appointed Francis B. Sayre, formerly Under Secretary of State, as High Commissioner of the Philippines.

The recent census showed the population of the Philippines to be 16,000,303 on January 1, 1939. In 1918 it was 10,314,310.

An amendment to the Independence Act, passed by the Congress August 7, 1939, exempts certain Philippine products from the export tax provisions of the Tydings-McDuffie Act, and imposes in lieu thereof a diminishing export quota effective as of January 1, 1940. No modification was made in the provisions of the Independence Act which imposed export taxes, to become effective January 1, 1941, on sugar and all other Philippine products shipped to the United States not expressly exempted therefrom. The amendment also provides for a joint conference to be held at least two years prior to July 4, 1946, for the purpose of formulating recommendations as to trade relations between the United States and the Philippine Islands when the islands shall have become independent.

The external trade of the Islands during the calendar year 1939, not including gold and silver, amounted to \$243,993,862. Shipments from the United States to the Islands were valued at \$83,427,853 in 1939, placing the Philippines in fifth rank as a customer, preceded only by

the United Kingdom, Canada, Japan, and France. Philippine shipments to the United States were valued at \$92,131,525.

At the present time, the Commonwealth government is in excellent financial condition. However, the matter of adjusting the Islands' economy as contemplated in the Independence Act, to a position independent of free trade with the United States, presents a most serious problem for the future.

In addition to the changes in the economic system of the Philippines which will be brought about by the Independence Act, world conditions caused by the war have already seriously disrupted foreign markets for Philippine products and the supply of ocean-going vessels to carry such products. It is well recognized in the Philippines that these problems will bring about widespread changes and they are being given serious consideration by Commonwealth officials.

A large part of the revenues of the Commonwealth government is derived from the refund of excise taxes collected in the United States. Congress requires that these funds be separately budgeted and accounted for and used for the purpose of preparing the Philippines for the responsibilities of independence. Reports from the United States High Commissioner indicate that the Commonwealth government is making an earnest effort to utilize these funds as required by Congress.

One of the principal functions of the Division of Territories and Island Possessions, insofar as the Philippine government is concerned, is to exercise general control and supervision over Philippine bonds and currency reserve funds for the purchase of bonds, payment of interest, and purchase of supplies.

During the year ended June 30, 1940, payments in total amount of \$8,483,904.02 were made from funds of the Philippine government. Of this amount \$2,220,338.27 was for supplies purchased in the United States and shipped to the Philippines, \$3,190,431.75 was for the purchase of Philippine bonds, \$2,567,555.00 was for interest on the Philippine public debt, and the remaining \$505,579.00 covered payment of salaries and expenses of Philippine personnel in the United States, pensions to retired Philippine employees, and for other miscellaneous purposes.

The Division, working closely with the Resident Commissioner from the Philippines, has endeavored to combat any legislation which would militate against Philippine interests. Bills continue to be introduced which discriminate against the rights of Filipinos in the United States as to employment, etc., on the ground that they are not citizens. The policy of this Department has been to endeavor to secure in the United States during the Commonwealth period

the same treatment for Filipinos that is accorded American citizens in the Islands.

Bank suits.—When the functions of the Bureau of Insular Affairs of the War Department were transferred to this Department there were a number of bank suits pending in the courts in connection with Philippine deposits that had been paid in full from the collateral furnished the Chief of that Bureau by the banks. These suits, inherited by this Department, were finally disposed of on March 25, 1940, when the United States Supreme Court decided that the action of the War Department and its officials had been in accordance with the law.

National Assembly of the Philippines.—The year 1939 was remarkable for the volume of domestic legislation and for the number and importance of laws which markedly affected business and finance. Nearly 100 measures were passed and approved during the year.

Among the more important of these were the immigration bill, approval of amendments to the Philippine Constitution, the general appropriation bill, providing for the expenditure of coconut oil excise tax refunds for the fiscal years 1940 and 1941, declaring Tagalog an official language in 1946, creating a National Coconut Corporation, a National Tobacco Corporation, a Bureau of Immigration, and a Department of Health and Welfare in the city of Manila. A measure amending the Internal Revenue Code, passed at the previous session, and the recent immigration bill require approval by the President of the United States before becoming law. The latter establishes a quota of 500 immigrants annually for each foreign nationality. The United States Immigration Act of 1924 was not applicable to the Philippines.

The following proposed amendments to the Constitution were submitted to the people at a plebiscite held on June 18, 1940:

1. Reduction of the tenure of the President and Vice President from six years, without reelection, to four years, with one reelection.
2. Establishment of a bicameral legislature through revival of the Senate, to be composed of 24 members at large, and increasing salaries of members of the legislature.
3. Establishment of a Commission on Elections which shall take charge of the conduct of all elections.

All amendments were approved by the people in a plebiscite held on June 18, but at the end of the fiscal year had not been formally submitted to the President of the United States.



NEW OPPORTUNITIES FOR PUERTO RICANS.

Finding new ways for improving economic conditions in the Island is one of the conservation problems tackled by the Puerto Rico Reconstruction Administration. Upper: Curing vanilla beans under the program for establishment of this new industry. Lower: Chicken raising on ranches like these is another new commercial development.

PUERTO RICO RECONSTRUCTION ADMINISTRATION

William D. Leahy, *Administrator*

DURING the fiscal year ending June 30, 1940, the Puerto Rico Reconstruction Administration continued its broad rehabilitation program, chiefly rural, designed to afford employment and to help the Puerto Ricans help themselves. So far as the legal restrictions on availability of relief money permitted, the Administration continued its search for practical solutions to some of the basic Insular economic and social problems, through the medium of demonstration projects undertaken on a small scale under competent leadership. New opportunities were created for individual betterment through providing rural people with hurricane-proof dwellings, small parcels of land for the cultivation of cash and subsistence crops, agricultural and marketing advice, instruction in the control of soil erosion, etc.

Funds were derived principally from \$7,000,000 appropriated by the Emergency Relief Appropriation Act of 1939, together with balances of approximately \$575,000 reappropriated from the Emergency Relief Appropriation Act of 1938 and \$1,290,930 available from the Puerto Rico Special Fund for obligation in 1940; and \$122,500 allotted out of the Puerto Rico Revolving Fund. The funds available during the fiscal year ending June 30, 1940, were obligated for the following purposes and amounts:

Rural rehabilitation-----	\$3, 268, 970
Engineering, including construction for rural rehabilitation-----	3, 171, 878
Rural electrification-----	1, 031, 940
Forestation-----	227, 100
Loans and assistance to farmers and cooperatives-----	701, 912
Housing management-----	122, 500
Administration-----	451, 460
Miscellaneous items-----	12, 670
Total obligated-----	\$8, 988, 430

By Executive Order of November 30, 1939, the Honorable William D. Leahy, Governor of Puerto Rico, was designated Administrator to succeed the Honorable Harold L. Ickes, Secretary of the Interior, who had resigned.

RURAL REHABILITATION

Recognizing that the economy of Puerto Rico is fundamentally agricultural, the P. R. R. A. has devoted most of its efforts to relief and rehabilitation in distressed rural areas. To this end it has functioned through units for land utilization, soil conservation, medical service, tick eradication, agronomy and marketing and livestock development. Necessary construction work incident to this broad program has been supervised by the Engineering Division.

Land utilization.—In each of the large resettlement developments is a central service farm from which the operations of the resettlers' farms, proper methods of cultivation, harvesting and marketing, and improved practices in breeding and distribution of poultry and livestock are demonstrated and supervised. Continued encouragement has been given to the planting of onions, which previously were almost entirely imported. During the fiscal year about 50 acres were planted by 200 resettlers producing 3,000 cwt, of which half was sold in local markets. Similarly, farmers have been encouraged to continue planting of vanilla, resulting in increased cultivation of 137 acres. Last year the P. R. R. A. vanilla curing plant received 2,905 pounds (now being cured) as against only 573 pounds of green beans the previous year. Last year's production brought \$5 a pound in the New York market, indicating the value of this crop, when properly developed, as a source of increased income for the Island.

Livestock and poultry.—The P. R. R. A. continued its program of improving the swine stock of the Island, so as to supplant the native breed with a more economical animal.

From the herds at the central service farms Castaner, La Plata, Vieques, and Zaldondo, 3,084 pigs were farrowed this year, of which 1,204 were distributed among resettlers, and 883 sold to farmers interested in the Hampshire and Duroc breeds. These pigs were all produced from pure-bred hogs imported from continental United States. The success of the work is indicated by the fact that this year twice as many pigs were distributed to resettlers, and four times as many pigs were sold to other farmers, than during the fiscal year 1939.

The poultry program, like the swine program, was initiated in 1937 with the aim of fostering a better breed. Although a mortality rate of from 25 to 50 percent must normally be expected in Puerto Rico, the Administration has succeeded in acclimating the New Hampshire Red breed. The breeding plant previously constructed at the central service farm at La Plata was continued in operation this year, producing 10,733 baby chicks, bringing the total produced to date to about 37,000 chicks. Of the production this year, 5,169 at eight weeks of age were distributed to the Administration's resettlers. An additional 4,707 were sold at broiler age to the public through auction.

Tick eradication.—The program to eradicate the fever tick in Puerto Rico was undertaken in 1935 as part of the original P. R. R. A. rural rehabilitation program. It has been financed exclusively with P. R. R. A. funds, in cooperation with the Department of Agriculture and Commerce of the Insular Government and the Bureau of Animal Husbandry of the United States Department of Agriculture. The program was designed to improve the grade and health of livestock so as to provide more and better milk and meat.

As has been stated in previous reports, the Island was divided into three zones, namely, western, middle and eastern. These zones were separated by established quarantine lines. At the present time, only one quarantine line is being maintained.

During the fiscal year 1940, the vat construction program was completed. A total of 154 vats was constructed in the eastern zone bringing to 1,126 the total number of vats constructed for the entire program.

Systematic dipping work was completed in the middle zone in January 1940, at which time dipping was undertaken in the eastern zone where approximately 170,000 heads of livestock are dipped every 14 days. Work has been completed in the western and middle zones.

The entire program will be completed in the fiscal year 1941, when it is expected that an additional allotment of \$200,000 will be made. With these additional funds, the systematic dipping work will be completed in the eastern zone by the end of January, after which a final cleaning-up program will be conducted over the entire Island between that time and June 1941.

Up to the beginning of the present year, a total of \$1,096,950 had been allotted for this program, and an additional \$459,450 was allotted this year, bringing the total allotment to \$1,556,400. The total cost of the program will be approximately \$1,756,000.

Loans to needy farmers.—As part of its program of rural rehabilitation and relief the P. R. R. A. two years ago started making small loans to needy farmers, for the purpose of raising crops and purchasing poultry and livestock. During the year just ended \$478,693 was loaned to 1,571 borrowers, as compared to \$211,221 loaned to 661 borrowers the previous year. As of June 30, 1940, 73.07 percent of the principal had been collected. The credit risk in loans of this type is not considered desirable by ordinary lending agencies. While the Government will sustain some losses, it is to be borne in mind that grants rather than loans could legally have been made; and that through these loans substantial betterment of the economic condition of many of the borrowers has been realized.

RURAL SANITATION AND HEALTH

The Rural Sanitation and Health Section confined its activities, as its name implies, to rural areas. The work, involving a con-

tinuation of previous programs of providing instruction in sanitation, health conservation, and preventive medicine, was carried out through the operation of 17 medical dispensaries at P. R. R. A. resettlement projects located in 14 municipalities in the Island.

The organization consisted of a central office and the 17 dispensaries, each staffed with a physician, nurse, sanitary inspector, clerk, and a janitor.

The services included visits and treatments to resettlers and their families at the various projects, analyses for water contamination, oilings for mosquito elimination, inspection of homes for sanitation defects, and other miscellaneous services. The central dispensaries also handled injury compensation work cases for the entire Administration.

Some of the accomplishments for the year were: 6,793 physical examinations; 1,146 clinics held; 86,519 visits to clinics by patients; 24,394 dressings made; 8,278 cases attended by nurses; 27,445 prescriptions written; 22,931 home visits made by nurses and physicians; 7,658 persons inoculated for typhoid and smallpox; 6,167 persons treated for malaria; 73 persons, in 350 treatments, treated for syphilis; 1,773 miscellaneous treatments; 76 persons treated by a specialist for rare diseases; 3,500 treatments for intestinal parasites; 6,422 oilings for mosquito destruction; 5,295 sanitary inspections at homes; 8,214 injections administered; and 817 injury compensation cases attended, involving 3,353 dressings and other treatments.

Obligations for the year totaled \$80,643 for the entire program.

SOIL CONSERVATION

During the year the demonstration of soil-conservation practices and land utilization was inaugurated in three new areas on Federal lands: Juan Domingo near Arecibo, Las Cuevas near Trujillo Alto, and in the San Sebastian region. Work in two of these new areas was completed during the year, in addition to the completion of seven areas of work commenced in prior years: Cayey, Mayaguez, Arroyo, Luquillo, Castaner, San Just near Trujillo Alto, and Vieques.

Funds were provided to carry out demonstrations on lands of private farmers, the same type of program as followed on Federal property, in cooperation with the Insular Agricultural Extension Service and other allied agencies. Work was conducted on five areas near Juncos, Coamo, Mayaguez, and Sabana Grande. As a result, a much larger number of farmers than heretofore received instruction and demonstration in proper soil-conservation practices, such as contour tillage, strip cropping, crop rotation, barrier strips, hill-side ditches, etc.

The intensive research projects looking toward development of improved methods of soil conservation were continued throughout the year with assistance of P. R. R. A. funds, in cooperation with the Federal Experiment Station at Mayaguez and the Insular Experiment Station at Rio Piedras. In addition, technical assistance was furnished to the P. R. R. A. Forestry Division in carrying out soil erosion control practices on the forest homesteads ("parceleros") on the Federal lands.

Briefly, some of the accomplishments during the year just ended were: 332,102 lineal feet of outlet channels protecting 2,843 acres; 173,882 lineal feet of diversion ditches protecting 878 acres; 234 lineal feet of hillside ditches protecting 765 acres; 137 miles of ridge terraces protecting 889 acres; 315 individual terraces protecting 384 acres; 526 miles of vegetative barriers protecting 1,204 acres; gully control, contour tillage, and strip cropping on 1,153 acres; and 102 miles of contour furrows protecting 340 acres.

In all, around 500 acres of land were worked on during the year. Employment given to workers and technical personnel averaged around 1,900 for the year, with a peak at one time of 3,000.

COORDINATED ACTIVITY WITH OTHER FEDERAL AND INSULAR AGENCIES

Since the fall of 1938 the P. R. R. A. has had a definite coordinated program designed to augment the existing inadequate facilities of the other agricultural agencies operating in the Island, to expand their research and development functions, and to make the best possible use of P. R. R. A. funds available for such work. Close cooperation has been maintained with both Federal and Insular agencies concerned with the agricultural problems of the Island. Examples of such cooperation during the fiscal year just ended were:

Insular Department of Agriculture and Commerce.—To aid in the development of a subsistence planting program, the P. R. R. A. spent \$24,000 principally in the employment of 22 agricultural agents, who supervised the planting of subsistence crops to provide work and food for needy persons on about 21,000 acres of private lands donated for such use by public-spirited farmers and sugar mills. It is estimated that more than 16,000 workers were benefited by this program.

Insular Agricultural Extension Service (University of Puerto Rico).—The P. R. R. A. provided technical personnel, at a cost of \$75,000, to work with the Director of Extension in continued development of the soil-conservation program, in investigating applications

for production loans made by the P. R. R. A., and in advising farmers in livestock and poultry development, growing of subsistence crops, farm management and marketing problems, 4-H Club activities, and the like. Home demonstration agents paid by the P. R. R. A. made over 17,000 visits to 8,300 homes; about 1,400 meetings were held; and progress in diet and food conservation was made by canning thousands of jars of fruits and vegetables at the P. R. R. A. canning centers.

With \$5,000 provided by the P. R. R. A. for technical personnel and materials, the Department of Botany and Pathology of the College of Agriculture of the University of Puerto Rico was enabled to continue important research on vanilla culture and the control of pests which threatened development of this prospectively important source of agricultural income. The Insular Experiment Station, with \$21,000 from the P. R. R. A., continued important experiments, with the cooperation of the School of Tropical Medicine, in proper feed for hogs and investigation of parasites in calves and horses. Important work was done in selection of sea-island cottonseed with a view to improving the grade of cotton produced in Puerto Rico. Also, with \$8,000 allotted by the P. R. R. A., the Tobacco Institute continued studies and experiments, particularly in the resistance of imported cigarette tobacco to disease and the identification of various tobacco diseases.

Federal Experiment Station (Puerto Rico Experiment Station of the United States Department of Agriculture).—Valuable experimental work started last year on bamboo, vanilla, spices, perfume, and medicinal-plant culture was again financed by the P. R. R. A., with \$26,275 for technical personnel, labor, and materials. Outstanding results are indicated from the propagation of species of bamboo, believed to be an industrially important product for Puerto Rico, and in the possibilities of an emergency supply of quinine.

COOPERATIVES

The P. R. R. A. worked during the past year with 16 cooperatives, including 3 newly organized. Valuable cooperation was extended by the Agricultural Extension Service, the Insular Department of Agriculture and Commerce, the Insular Department of Education, and the Federal and Insular Experiment Stations.

Lafayette Sugar Cooperative.—Operations of the Lafayette Sugar Mill Cooperative were satisfactory. During the year it produced 236,485 bags of sugar of 250 pounds each from 249,095 tons of cane. The average sugar yield from cane ground was 11.867 percent, as against 12.794 average for the 1939 season. This decrease was due partly to the grinding of overmature cane that was left over from the 1939 season because of then-existing quota restrictions and partly to a

prolonged drought. Despite the lower sugar yield and the increase in hourly wage rates from 25 to 30 cents under the Fair Labor Standards Act, the mill accomplished a reduction in manufacturing costs.

Unfortunately, the 12 land cooperatives, to which sugar lands were sold on credit by the Government, have not experienced like success and will have to be liquidated.

The members of these land cooperatives have authorized reconveyance of their holdings to the Government for credit at the fair value thereof on their mortgage obligations to the Government, and this reconveyance is now in process of being consummated. It is planned to subdivide the lands into relatively small parcels, each with a sugar quota, and to sell them to small experienced sugarcane growers. Thereby the investment of the Government will be safeguarded, the fundamental objective of the project for more equitable distribution of lands still will be realized, and laborers in the area will be assured of more employment than they were likely to have from the failing cooperatives.

The construction of a plant by the mill cooperative, with a loan of \$550,000 from the P. R. R. A., to provide facilities for experimenting with the conversion of cane byproducts into solvents such as butyl alcohol and acetone, has been completed. The plant, now in full operation, has a capacity for converting annually 2,500,000 gallons of molasses into 5,000,000 pounds of mixed solvents. Not only will this plant produce byproducts as an offset to quota restrictions limiting the production of raw sugar, but such products should also be of exceptional value in case of war.

Los Canos Sugar Cooperative.—The purchase in March 1939 of the other sugar-mill property, Los Canos, was financed by a P. R. R. A. loan of \$619,000 to a cooperative over 90 percent of whose members are needy farmers. No land purchases were involved, outside of the 42 acres immediately surrounding the mill. The cooperative members individually own or lease some 8,000 acres of land in the mill area. An additional loan of \$200,000 was made to this cooperative just before the close of last year for improvements, principally in machinery to increase production capacity. These improvements have now been made. Additional loans during the year just ended totaled \$110,000 for purchase of equipment and operating expenses. During the 1940 grinding season, Los Canos produced 152,713 bags (250 pounds each) and 26,570 bags (100 pounds each) of raw sugar from 186,190 tons of cane. The average yield of sugar per 100 pounds of cane was 11.066, a decrease (for the same reason as in the case of the Lafayette mill) of 0.745 percent from the 1939 season average.

Vegetable cooperatives.—The four vegetable cooperatives are producing winter vegetables, such as tomatoes, cucumbers, peppers, and string

beans, principally for the New York market. These cooperatives increased the total Island export of tomatoes from 9,381 lugs last year to 33,388 lugs during the present year, an increase of 356 percent. Gross receipts of the four cooperatives totaled \$124,654, and each operated at a profit. In one cooperative, individual members sustained losses due to sudden vegetable blights. Most of the members received a net profit equal to production cost. Some even trebled their investments. A Puerto Rican farmer under P. R. R. A. guidance in April of this year established a record price for tomatoes on the New York market when he received \$8.40 for a lug of tomatoes. Three of the four vegetable cooperatives were granted small operating loans during the past year, totaling in all \$17,000.

Vanilla cooperative.—The vanilla growers' cooperative, an outgrowth of encouragement given to growers by the P. R. R. A. through production and distribution of vanilla cuttings to growers on a loan basis, instructions in growing, and the construction of a pilot plant for curing vanilla, is marketing vanilla for its members. The cured vanilla beans marketed by the member-growers last year amounted to only 140 pounds, whereas this year the cooperative will probably market 800 pounds.

Other cooperatives.—The Puerto Rico Marketing Association for Minor Crops, producing sea-island cotton, increased its total sales from \$64,587 in 1938 to \$128,367 in 1939, and it is now estimated that the crop being ginned will exceed \$200,000. A P. R. R. A. loan of \$30,000 was made to this cooperative to enable it to advance to its members 50 percent of the value of the cotton when delivered for ginning.

The purchasing cooperative (Sociedad Agricola), purchasing farm supplies for its members, increased its volume of annual business from \$216,000 to \$477,206. The P. R. R. A. made an additional loan of \$25,000 to the cooperative during the past year for working capital.

Additional operating loans totaling \$35,000 were made during the year to the fruit-growers' canning cooperative at Arecibo. The cooperative canned 24,440 cases of fruits and fruit juices, as compared with less than 10,000 cases during the previous season. The restrictions of the Fair Labor Standards Act, however, necessitated discontinuance of the canning of orange juice.

The Puerto Rico Rug Cooperative, although less than two years old, had an \$8,883 volume of business this year, of which a little more than \$2,000 represented profits for its members, on a total investment of only \$5,000.

The manual arts cooperative (Puerto Rico Artercraft Cooperative), to which the P. R. R. A. made a loan of \$20,000 last year, has been in operation for 8 months, during which time it has sold \$15,000 worth of hand-made products delivered to it by needy persons. Since the P. R. R. A. loan was available only for assistance to rural persons, the

cooperative consequently encountered difficulties in securing a sufficient variety of hand-made products to complete a full line of articles for its salesroom. During the next fiscal year it is, therefore, planned to repay the loan to the P. R. R. A., and to secure a loan from the Puerto Rico Self-Help Corporation, through which the arcraft cooperative may assist both urban and rural persons, thus enabling it to obtain hand-made articles produced in urban as well as rural areas.

The coconut-growers' cooperative was organized during the past year in response to petitions from growers on the Island, for the purpose of marketing coconuts produced by members, either as fresh fruit for export or through a plant recently established in the Island for the production of shredded coconut.

The Cooperative Handcrafts, Inc., of Puerto Rico, organized by the Puerto Rico Self-Help Corporation, had been forced to discontinue operations, because of inability to meet the requirements of the Fair Labor Standards Act. It is now in liquidation under supervision of the P. R. R. A. Cooperative Division.

Summing up, it may be said that the cooperative movement in Puerto Rico is steadily growing and improving. Those who are working with it, including cooperative members, management, cooperating public agencies, and the public in general, are gaining valuable experience in cooperative effort.

Cooperatives With Which the Cooperative Division of the P. R. R. A. Is Working

Name	Year organized	Financing agency	Products	Members	Amount invested	Annual business
1. Asociación Cooperativa de Productores de Vegetales de Puerto Rico.	1930	Insular Government.	Vegetables...	25	\$4,000	\$38,623
2. Puerto Rico Tobacco Marketing Association. ¹	1934	do	Tobacco...	1,688	35,400	492,578
3. Puerto Rico Marketing Association for Minor Crops.	1935	Insular Government and P. R. R. A.	Cotton...	762	61,354	128,367
4. Cooperative Handcrafts, Inc., of Puerto Rico. ²	1936	F. E. R. A.	Needlework		13,734	
5. Asociación Azucarera Cooperativa Lafayette.	1936	P. R. R. A.	Sugar	751	4,875,718	2,275,708
6. Arecibo Fruit Growers' Cooperative Association.	1937	do	Fruit	85	103,000	35,592
7. Asociación Cooperativa de Productores de Hortalizas de Jayuya, Inc.	1937	do	Vegetables	130	7,000	35,675
8. Primus Potteries Cooperative, Inc. ^{2,3}	1938	F. E. R. A.	Earthenware		30,000	
9. Puerto Rico Rug Cooperative, Inc. ²	1938	do	String rugs	271	5,000	8,883
10. Sociedad Agrícola Cooperativa de Puerto Rico.	1938	P. R. R. A.	Farm supplies.	723	200,000	477,206
11. Puerto Rico Arcraft Cooperative	1939	do	Handicraft	203	12,500	15,011
12. Cooperativa de Cosecheros de Vegetales de Río Grande.	1939	do	Vegetables	125	5,000	19,640
13. Cooperativa Azucarera Los Caños.	1939	do	Sugar	373	955,870	1,045,932
14. Cooperativa de Cosecheros de Vainilla de Puerto Rico. ³	1939	do	Vanilla	23	46	
15. Villalba Vegetable Growers Cooperative Association.	1940	do	Vegetables	96	5,000	30,715
16. Cooperativa de Productores de Coco de Puerto Rico.	1940	do	Coconuts	45	90	
Total				5,300	6,316,712	4,603,930

¹ Application for loan pending.

² Cooperatives organized by Puerto Rico Self-Help Corporation with F. E. R. A. funds.

³ This is a marketing cooperative with no capital invested. Crop not sold yet.

⁴ Could not operate under Fair Labor Standards Act requirements and is being liquidated.

⁵ Has been discontinued as a cooperative and sold to private interests.

SOCIAL SERVICE

In April 1936 the Social Service Section was established within the former Health Division to educate families in the rural resettlement projects in ideals of citizenship, and to provide facilities through which rural dwellers might better themselves and develop a more healthy understanding of community life. The work subsequently was placed under a Community Centers Section through which it has been carried out during the year just ended.

The work has been conducted through sixteen community centers, all located at P. R. R. A. resettlement developments, in furtherance of rural rehabilitation under funds allotted for that purpose. The extent of activities is indicated by the following: More than 700 applications for P. R. R. A. homesteads were investigated for eligibility in certain social aspects; 61 clubs, averaging in membership from 5 to 130 persons each, held about 925 individual sessions, involving an attendance of some 7,600 men and 5,800 women; 70 classes were organized, primarily for handicrafts, needlecrafts, wood-carving, adult education, and kindergartens, involving about 6,400 sessions and 15,600 men and 49,100 women in the aggregate; 24 special interest groups such as glee clubs, dramatics, debating, etc., functioned, holding about 550 sessions; other activities such as athletics, movies, etc., occupied 26,000 hours with a total of 308,000 spectators; several thousand visits were made to homesteaders and their families. A total of about 2,290 families with some 13,000 persons were considered as members of the several community centers.

Obligations for this program during the year just ended amounted to \$97,018. Since funds appropriated for the fiscal year 1941 will not permit continuance of the work, arrangements have been made to transfer all buildings and equipment to the Insular Department of Education.

HOUSING MANAGEMENT

Total rental collections from all P. R. R. A. housing units during the fiscal year amounted to \$221,290, as against total obligations for operations, including maintenance and repair, of \$119,923, leaving a net return of \$101,367, or \$16,630 more than the previous year. In the fiscal year 1939, obligations represented 59.48 percent of collections; this year obligations were 54.19 percent of collections, a net gain of 5.63 percent.

On June 30, 1940, all but nine of the 1,051 living units in the 5 urban developments were occupied, occupancy thus being 99.15 percent. In the rural areas, 2,263, or 91.51 percent of the 2,473 units in the large resettlement projects were occupied; in the scattered units

outside of these concentrated resettlement projects, 2,036, or 88.48 percent of the 2,301 dwelling units were occupied. The P. R. R. A. also leased at nominal rental of 50 cents a month each, 3,725 parcels of two to three acres in the various coffee, tobacco, and fruit areas, on which no houses have been built, these parcels being leased for cultivation by laborers who previously worked for the P. R. R. A. in connection with its rehabilitation program.

FORESTRY

A general forestry program for Puerto Rico, inaugurated in 1935, was continued under the joint auspices of the P. R. R. A., the Insular Forest Service, and the United States Forest Service. Up to June 30, 1940, P. R. R. A. had spent a total of \$255,489 for the purchase of 19,372 acres at an average cost of \$13.19 per acre. During the fiscal year just ended, 886.13 acres were purchased, amounting to \$10,597, or an average cost of \$11.96 per acre, with 3,689.74 acres under purchase options.

Parceleros.—The program of establishing forest homesteads (parceleros) in various forest areas was continued throughout the past year. Residence and cultivation permits have been and are being issued free of charge for from 5 to 10 acres of land. Permittees may reside and grow food crops on their lands, use wood from the forest for construction and repair of houses and other buildings and for fuel, in return for which each must reforest 2 acres of nonagricultural land. In addition, where such work is feasible, part-time employment usually running about two weeks per month is afforded on nearby forestry projects. As a means of further increasing the parcelero's income, materials from the forest will be wholesaled to the permittee as they become available for the manufacture and sale of charcoal, fence posts, etc.

During the fiscal year the acreage contained in individual homesteads was expanded where parts of tracts were deemed too steep and rocky. This resulted in a slight reduction in the number of permittees. Thus on June 30, 1940, there were 3,450 acres occupied by 690 families, contrasted with 2,148 acres in 700 homesteads on June 30, 1939.

Other forest activities.—During the year, 7 miles of truck trails at an average cost of \$9,550 per mile and 18 miles of foot and horse trails at an average cost of \$300 per mile were constructed, bringing the totals to 67 and 90, respectively.

Thirteen small field nurseries were operated to provide tree seedlings for planting and replanting work, producing approximately 2,074,000 seedlings, of which about 815,000 were planted. The total

production to date is estimated to be about 20,000,000 seedlings. New planting covered 709 acres at an average cost of \$10.70 per acre, while the replanting of areas previously planted to valuable tropical hardwoods covered 1,055 acres at an average cost of \$2.95 per acre. Approximately 7,200 acres of plantations were weeded 3 times during the year and vines removed from the trees at an average maintenance cost of \$6.25 per acre.

Timber stand improvement through the removal of weed species and malformed trees, was carried on in 3 forest areas, totaling 1,721 acres, at a cost of from \$6 to \$15 per acre. In addition, 1,168 acres of mangroves were planted in five areas at a cost of from \$3 to \$5 per acre.

ENGINEERING

Construction and repair work incident to the prosecution of the approved projects of the P. R. R. A. is the function of its Engineering Division. A summary of the year's activities shows:

The mill work for the pilot plant at the Tobacco Institute of Puerto Rico at Rio Piedras was completed, bringing the total project cost to approximately \$22,200. The home for aged women at San Juan was finished this year at a total cost in Federal funds of \$74,190, the municipality of San Juan contributing \$27,500. The restoration of two new wings to the headquarters building for the Insular Police at San Juan was finished early in the year at a total cost of \$42,190. A stadium for the Municipal Ball Park at Guayama was built at a cost of \$22,532.

Four concrete vocational education schools and a second-story for the Eleanor Roosevelt school, started last year, were finished this year. In addition, P. R. R. A. vocational schools at four resettlement projects were repaired. The four-story concrete engineering building of the college of agriculture and mechanic arts at Mayaguez, costing \$164,000, was completed except for minor details.

Two 1-story concrete R. O. T. C. armories, belonging to the University of Puerto Rico, started last year at Rio Piedras and Mayaguez, were completed at a cost of \$74,042 and \$50,049, respectively. The 3-story concrete library building and the 4-story concrete laboratory building at the School of Tropical Medicine, undertaken last year, were brought to within 5 percent of total completion.

The filling and draining of swamp lands near the Lafayette Sugar Mill, important especially to the checking of malaria, was completed with an allotment of \$45,000. Out of an allotment of \$476,429, work on 17 other new swamp drainage and malaria control subprojects was prosecuted during the year, the project locations being recommended by the Insular Department of Health.

Twenty-eight water-supply systems were commenced in several of the Federal resettlement areas at a cost of \$211,530, representing a physical completion of about 82 percent.

The largest expenditure was for the continuation of the program for constructing small resettlers' houses in the rural areas. Five hundred forty-one houses, partly constructed last year, were finished this year. In addition, the construction of 1,211 additional houses, entailing an expenditure of some \$1,712,000, was undertaken during the year. On June 30, 1940, there were 491 unfinished.

Continuing a program begun in prior years, approximately 14 miles of macadam roads were constructed in P. R. R. A. resettlement projects. In addition, 10 miles of trails leading from main roads to resettlers' houses were constructed and 39 miles of road graded. A total of \$40,488 was expended for such works as small storehouses, community centers and playgrounds, etc., including house wiring and street and park lighting. Eight hundred twenty-four animal-shed sets, each consisting of a granary, chicken coop and hog pen, were constructed at a cost of \$60,130.

A small hydroelectric plant for the Isabela Irrigation Service at Isabela was started and 70 percent completed at a cost of \$69,747.

The land survey section surveyed 695 parcels of land covering 4,115 acres. One hundred sixty aerial maps were furnished to other government agencies.

The landing field for the United States Marine Corps at Culebra was improved at a cost of \$30,000 through the installation of a complete tile drainage and the construction of open concrete line canals for disposing of excessive drain water. A project financed by W. P. A. for the construction of a tennis court at the United States Naval Radio Station in San Juan was administered by the Division.

During the year just ended, the Engineering Division employed an average of 8,680 men.

RURAL ELECTRIFICATION

Undertaken as an aid to the Insular Government for the development of water power, the program has embodied five separate projects. Three of these—Toro Negro Plants Nos. 1 and 2, and El Carite No. 3—have been completed with a power potentiality totaling 40,000,000 kilowatt-hours. The Las Garzas project, after being partially completed by P. R. R. A., was transferred in December 1938 to the Insular Government for completion under a loan and grant from the P. W. A. The fifth project, known as Dos Bocas, located between the cities of Arecibo and Utuado, is the only one which P. R. R. A. has had under construction this year.

The Dos Bocas project consists of a gravity type concrete dam 1,115 feet long by 185 feet high, and a power plant with an ultimate capacity of 25,000 horsepower. The reservoir will cover about 600 acres with a capacity of 30,600 acre-feet.

During the present year, \$1,030,940 was allotted for the project, bringing the total to date to \$3,497,000. With these funds, the project has been brought to about 60 percent of completion. For the fiscal year 1941, it is expected that \$1,960,000 additional P. R. R. A. funds will be allotted to complete the dam, powerhouse, penstocks and tail-race, and various auxiliary works, as well as to pay for lands for the reservoir and the installation of one generating unit of 8,333 horsepower.

THE FUTURE

There are a few encouraging prospective palliatives of the distressed Puerto Rican economy. The recent amendment of the Fair Labor Standards Act, as it applies to Puerto Rico, providing for a special committee to study and recommend the minimum wages to be paid to employees in Puerto Rico, may eventually stabilize employment and improve the condition of that part of the population which is dependent upon commerce as distinguished from agriculture. The intensified national defense program is employing a considerable amount of labor, temporarily relieving to some extent the ever-prevailing serious unemployment situation; but this has obviously neither absorbed nor offset the many thousands of women unemployed as a result of the closing of the needlework industry. The basic economic problem of Puerto Rico—that of a dense and ever-increasing population attempting to wrest a livelihood, mainly by agriculture, from exceedingly limited resources—remains unsolved.

The P. R. R. A. has done much to point the way toward increasing the income of the island both through physical accomplishments and by stimulating leadership in better methods of farming and new industries. Two outstanding examples of experiments which resulted in finding new industries economically sound are the cement plant constructed by the P. R. R. A. for the Insular Government, and the plant constructed at Lafayette with funds loaned by the P. R. R. A., for converting sugarcane residue into solvents such as acetone and butyl alcohol. Further industrial and agricultural development of the Island must depend upon progressive leadership and the availability of capital for full utilization of all of the Island's resources.

In both respects the P. R. R. A., it is believed, has made as substantial contributions as could be expected in the light of the limited funds and authority provided for its use under the Emergency Relief Appropriation Acts.

DIVISION OF INVESTIGATIONS

B. B. Smith, *Director*

THE Division of Investigations made substantial contributions to the defense program during the past fiscal year. The War Department was assisted in its program of national defense through the examination and classification of lands withdrawn for artillery ranges, aircraft bombing ranges, and other defense purposes, and in one case the Division assisted the Department of Justice in obtaining a restraining order preventing mineral claimants from performing work that was interfering with the use of the land as an airplane landing field for Army bombers. This cooperative work is continuing and additional requests for assistance by the War Department on other areas needed in connection with the national defense program has very considerably increased the work of the Division. This work will result in the cancellation of additional thousands of invalid mining claims and thus help the War Department protect itself from unjust claims for damages by persons attempting to hold title to the lands.

During the past several years in connection with investigations of various types for the Grazing Service particularly, considerable information as to the status of public lands has been secured. This information is being made available to the Army Air Corps for the purpose of enabling it to arrive at a decision as to what lands might be desired for inclusion within certain proposed bombing and gunnery areas.

For the purpose of determining the best economic use to which Kodiak Island in Alaska may be put, the Division has been making an investigation of general conditions on this island. Other work in Alaska has been intensified primarily because of the increased activity in the Territory due to plans for national defense, and examinations and classifications of lands have been made in connection with reservations established for the use of the War Department and the Civil Aeronautics Authority.

The work being done for the General Land Office by the Division of Investigations has become more intensified along the line of land classification and appraisal in the aid of the general conservation program of the Department. Many of these cases involve mineral examinations which not only assist in the general classification pro-

gram but incidentally furnish valuable information to the Geological Survey in the location of mineral deposits vital to the national defense program.

COOPERATION WITH OTHER AGENCIES

The cooperative work carried on with the Bureau of Reclamation is continuing and must be carried forward to keep pace with the construction activities in connection with the Grand Coulee, Shasta, and Friant Dams and other reclamation projects. All lands affected by these projects believed to contain mineral values are being examined and appraised by this Division and all invalid mining claims on the public lands affected are being examined and proceedings instituted to cause their cancellation. In one case the Division was able to present facts that resulted in a settlement for less than \$5,000, whereas the claimant had originally proposed a settlement on the basis of a valuation of \$50,000 for his land.

During the past year the Division continued to cooperate with the National Park Service and gathered information to assist in the land-acquisition program of the Olympic National Park, Wash., and to aid the Department of Justice in the handling of proposed condemnation suits with particular reference to alleged mineral values. Examinations and appraisals of lands within the Joshua Tree National Monument, Calif., are being made and proceedings have been instituted looking toward the cancellation of approximately 2,900 invalid mining claims affecting this area. Similar work has been done on lands recently added to Yosemite National Park, Calif. The Division also cooperated with the National Park Service in an investigation involving the theft of petrified wood from the Petrified Forest National Monument, Ariz., which resulted in the conviction and imprisonment of the person guilty of the theft.

The Division has assisted in the handling of cases affecting the conservation and use of public grazing lands, particularly with regard to applications for leases provided for under section 15 of the Taylor Grazing Act. In the performance of this work it is the policy of the Division to cooperate with the applicants to the fullest extent. Wherever possible conflicting applicants are brought together in an attempt to arrive at adjustments which would be satisfactory to the respective applicants, and at the same time meet with the requirements of the law and regulations as to the proper division of land and the conservation of grazing resources. This has been successful in most cases, but occasionally there have been conflicts concerning which it was impracticable to induce conflicting applicants to reconcile their differences. In such cases it has been necessary to recommend a division of lands which appeared equitable and in accordance with the law and regulations. There have been but very few appeals from the

recommended awards and, generally speaking, applicants for grazing leases are entirely satisfied with the awards which have been made as the result of the examinations and negotiations conducted by the Division of Investigations, and have been particularly pleased with the dispatch with which their applications have been acted upon. During the fiscal year 2,797 applications were investigated and reports submitted thereon for administrative action.

A number of grazing trespasses on public lands within grazing districts were investigated, resulting in the institution of either criminal or civil proceedings in the Federal courts. Other assistance rendered the Grazing Service included the service of notices pertaining to an important suit involving the administration of grazing lands in the State of Nevada.

During the fiscal year 1939 this office was called upon to make a survey of the property, equipment, and records of the United States Helium Plant, Amarillo, Tex., for the purpose of determining the cost of producing salable helium. The Bureau of Mines during the fiscal year 1940 again requested that this survey be made and in addition to making the survey and reporting the results thereof, agents of this office designed and installed supplemental cost accounting analysis records for this plant.

In view of the proposed transfer of those special agents engaged in making audits of various units under the Office of Indian Affairs, that work received special attention with the result that on the effective date of the transfer, July 1, 1940, such audits were on an approximately current basis.

Considerable work in connection with the examination of lands involved in applications for mineral patent and mining locations was done for the United States Forest Service, Department of Agriculture, under the interdepartmental agreement of 1915. A number of these cases resulted in the institution of adverse proceedings for the cancellation of the mineral entries or mining locations involved.

Attention has been given to the question of stock-driveway withdrawals. Many of the stock driveways were laid out many years ago and in some cases have been found to be disproportionate for their actual needs. One of those examined is approximately 60 miles long and from 5 to 6 miles wide. In the examination of this driveway there was involved the determination as to the lands accessible and necessary for a driveway, as it was evident that large portions of the withdrawn lands were being used for pasturage, lambing, and grazing grounds, rather than for the driving of stock to or from seasonal ranges or to market. Other driveways were found not to embrace sufficient lands, an example of which is the "33-Mile Drive" in Natrona County, Wyo. This driveway, which consists of two parts, starts at

the railway shipping points of Powder River and Arminto, and are known respectively as the "East 33-Mile Drive" and the "West 33-Mile Drive." Farther to the north and on the southeast slope of the Big Horn Mountains, these two driveways join and continue northward into the Big Horn Mountains. At this junction the trail was found to be only one-fourth mile wide, although stockmen have estimated that more than 120,000 sheep use this trail twice, going up to the mountains and coming back to the desert, in a single year. Stockmen have petitioned that an extra one-half mile be added to this strip through which, it has been estimated, more sheep pass than in any similar section of land in the world.

The following investigations, on which reports were submitted during the fiscal year ended June 30, 1940, were referred to the Attorney General for criminal prosecution:

Bribery	1
Conspiracy	2
Embezzlement	1
Forgery	1
Fraudulent homestead entry	1
Illegal trading with Indians	1
Impersonating a Government officer	1
Incendiary forest fires	1
Perjury	1
Possession of firearms within a national park	2
Soliciting political contributions	1
Submitting false claims against the United States	5
Theft of Government funds	1
Theft of Government property	2
Unlawful disposition of livestock	1
Trespass:	
Coal	3
Timber	3

Indictments were returned against 15 individuals and 1 corporation. Sentences were imposed in 14 cases, either upon convictions or pleas of guilty.

The Division has cooperated with other law-enforcement agencies in the apprehension and prosecution of persons engaged in the practice of fraudulent schemes in connection with the filing of applications for oil and gas leases. One defendant who was convicted in the State court on grand theft charges was fined \$1,500, sentenced to 18 months in the county jail of Los Angeles, and placed on probation for a term of 15 years. In another case the defendants were arrested and held in jail awaiting trial in the State court on grand theft charges. Other similar cases are also receiving attention.

An investigation of unusual interest made by this Division during the fiscal year 1940 was for the purpose of locating one Lloyd Patter-

son, alias Richard Jordan, who was under indictment for the theft of Government property in Puerto Rico. The search for Jordan led from Puerto Rico through a great portion of the United States, finally terminating in his apprehension in Philadelphia on November 15, 1939. During the search for Patterson most of the property stolen by him, consisting of motion-picture cameras and equipment, was recovered by agents of this office. In his flight from place to place, Patterson had sold this property to obtain funds. Upon the apprehension of Patterson it was ascertained that he was a parole violator from McNeil Island and that he had approximately two dozen aliases. After serving the balance of the original sentence, he was returned to Puerto Rico where he entered a plea of guilty to the theft of the property and was sentenced to prison for a term of 8 years.

One investigation involved the application for right-of-way of the Utah Oil Refining Co. of Salt Lake City, Utah, which, during the fall of 1939, constructed an 8-inch oil pipe line from Fort Laramie, Wyo., to Salt Lake City, Utah. Investigation was made for the purpose of enabling the Department to consider the application for right-of-way, and in view of the rapidity with which the construction of the pipe line was carried on, it was necessary to conduct the investigation expeditiously and in an intensive manner. This pipe line involved an expenditure of approximately \$3,000,000 and the application for right-of-way involved public land throughout a greater distance than any right-of-way application in modern times, and probably since the construction of the transcontinental railroads.

A task of considerable magnitude was the collection of evidence relating to the validity of numerous oil placer claims in the Lance Creek oil field in Wyoming. Practically every special agent in one of the regional offices had a part in the effort to locate owners or interested parties in these claims and obtain additional evidence concerning claims previously reported on. A great deal of difficulty was experienced because of the fact that a number of the individuals to be interviewed had not worked in the Lance Creek field for 20 years and were scattered not only throughout the United States, but in some cases had migrated to foreign countries.

Another unusual investigation had to do with an oil and gas lease embracing public lands of the United States in the South McCallum Field, Colorado. In connection with this case it was necessary to conduct an investigation as to the equities of the lessee and the operating company. It was also necessary to make a study of the economic factors relating to the possible production of oil and gas, and also conduct a geological study with respect to the possible discovery of petroleum products and the future development of the field in accordance with the conservation policies of the Department.

A special effort was put forth by one of the regional offices to determine the extent of occupancy of public lands in cases where no attempt had been made by the occupants to obtain title from the Government. A surprising number of instances were found where settlements had sprung up. One such settlement, Bumble Bee, Ariz., included, besides the post office, a filling station and 5 dwelling houses. As a result of this survey, it is contemplated that action will be taken to require the occupants to clear their titles or vacate the lands.

SUMMARY

The number of employees in the Division of Investigations as of June 30, 1940, was 147, exclusive of those who were serving temporary appointments. Of that number 133 were paid from the regular appropriation and 14 from allotted funds. The Division consists of a central office and 5 regional offices which are located at San Francisco, Calif.; Billings, Mont.; Salt Lake City, Utah; Albuquerque, N. Mex.; and Washington, D. C.

During the year investigations were made which affected practically every activity of the Department, and a number were made for other agencies of the Government. On July 1, 1939, there were pending 8,907 cases for investigation. During the year 20,326 new cases were received and reports were submitted on 15,001, representing the largest number of cases investigated during any year since the formation of the Division of Investigations. At the end of the fiscal year there remained uninvestigated 14,232 cases.

EXPENDITURES

During the fiscal year 1940 the Division of Investigations operated under an appropriation of \$548,000 which was expended as follows:

Salaries:

Departmental.....	\$ 38,379.50	
Field.....	329,748.42	
		\$368,127.92
Office supplies and equipment.....		7,398.00
Travel expense and per diem.....		111,940.00
Purchase, maintenance, and operation of automobiles.....		40,534.00
Communication expenses.....		2,150.00
Transportation of things.....		2,200.00
Rent of office space.....		2,700.00
Repairs to equipment.....		216.00
Stenographic services.....		77.20
Miscellaneous current expenses.....		3,170.00
Unobligated surplus.....		9,486.88
Total appropriation.....		548,000.00

OFFICE OF THE SOLICITOR

Nathan R. Margold, *Solicitor*

Constant expansion of the essential services rendered the public by the Department of the Interior, and greater particularization of the duties required from the Department by law, have long combined to produce a steady and rapid increase in the demands for legal assistance made upon the Solicitor and the personnel of his office. This upward trend persisted throughout the fiscal year 1940.

Many of the duties of the immediate office of the Solicitor have a vital bearing upon the national defense. The conservation, protection, development, and utilization of petroleum and other mineral resources, the harnessing of water power for the production of hydroelectric energy, the maintenance of the livestock supply without which no army could long continue to function, the conduct of essential governmental operations in the territories and outlying possessions, and the application of the public lands to the upbuilding of a strong national economy are all activities whose national defense significance is manifest, and whose conduct would be very nearly impossible without competent legal services.

Analysis of the work in the immediate office of the Solicitor indicates that its volume was approximately 20 percent greater during the fiscal year 1940 than during the preceding fiscal year. The number of oil and gas leases presented for consideration was, for example, more than double the number received in the fiscal year 1939. This increase was registered notwithstanding reductions in certain classes of items resulting from transfers of final responsibility to other offices.

The volume of legal work handled in the immediate office of the Solicitor is indicated by the following table:

Requests for formal Solicitor's opinions.....	380
Legal memoranda and correspondence.....	1, 142
Appeals from adjudications of the General Land Office and Grazing Service.....	439
Motions for rehearings and petitions for the exercise of supervisory authority.....	71
Board of Equitable Adjudication cases.....	1, 393
Legislative matters.....	1, 626
Construction and supply contracts.....	1, 553
General Land Office matters, except mineral and grazing leases.....	3, 527

Oil and gas leases-----	2, 161
Other mineral leases-----	172
Grazing leases-----	2, 263
Geological Survey matters-----	205
Bureau of Mines matters-----	101
Petroleum Conservation Division matters-----	47
War Minerals Relief cases-----	183
Grazing Service matters-----	185
Office of Indian Affairs matters-----	8, 886
Bureau of Reclamation matters-----	1, 245
National Park Service matters-----	1, 053
Division of Territories matters-----	317
Division of Investigations matters-----	122
Biological Survey matters-----	803
Bureau of Fisheries matters-----	93
St. Elizabeths Hospital matters-----	6
Alaska Development Program matters-----	4, 552
Miscellaneous items-----	249
Total-----	32, 774

Thirty-seven suits in the District Court or Court of Appeals for the District of Columbia and two in the Supreme Court of the United States were defended by the Solicitor and his staff during the year. Fifteen of these were suits brought against the Secretary of the Interior or other officers to test the legality of acts performed by them in an official capacity. The remaining 24 were suits instituted under the provisions of the war minerals relief legislation.

Questions of vital importance to the preservation of the interests of the United States in the oil and gas deposits of the public domain, together with complex problems of administrative law, were presented in *Dunn v. Ickes*, a case brought to test the scope of the authority vested in the Secretary of the Interior with respect to the consideration of applications for oil and gas leases under the Mineral Leasing Act of February 25, 1920. Decisions upholding the contentions of the Department in this controversy were entered by both the District Court and the Court of Appeals.

The highly important suits of *Fox v. Ickes*, *Parks v. Ickes*, and *Eder v. Ickes*, contesting the authority of the Secretary of the Interior to redetermine the amount of water deliverable to water users on a reclamation project under the contracts now in effect, and to impose rental charges for water used in excess of the amount thus redetermined, were tried in the District Court and a decision sustaining the position of the Department rendered. The case of *Burley Irrigation District v. Ickes*, raising issues fundamental to the utilization of water on reclamation projects for the generation of hydroelectric power, was

argued in the Court of Appeals, after a decision favorable to the Department in the District Court during the preceding fiscal year.

In *Glass v. Ickes* the action of the District Court in dismissing a libel suit attacking the privileged character of public statements made in the performance of official duties was sustained by the Court of Appeals. This decision clarifies authorities of the Secretary of the Interior and other Department heads that are of prime importance to the efficient conduct of the public business.

The transfer of the functions of the Bureau of Insular Affairs from the War Department to the Department of the Interior, which became effective on the first day of the fiscal year, added an entirely new type of litigation work to the duties of the Office of the Solicitor. This work consisted of the defense in the Supreme Court of the United States of actions against officials of the Commonwealth of the Philippines brought in the insular courts and sought to be appealed to that tribunal.

During the course of the year the Court of Appeals disposed of the War Minerals Relief cases of *Mineral Ridge Manganese Corporation v. Ickes* and *Crowley v. Ickes* on a basis in line with the contentions of the Department. In the former case the holding of the District Court that determinations of the Secretary of the Interior rendered pursuant to the War Minerals Relief Act of May 18, 1936, are not reviewable was affirmed. Fourteen War Minerals Relief cases instituted under other laws were disposed of by the District Court, leaving eight such cases pending at the close of the fiscal year.

The preparation of decisions in public land cases appealed from the General Land Office and in grazing cases appealed from the Grazing Service is another highly important duty of the Solicitor. The number of appeals disposed of during the fiscal year was 535 and the number of appeals pending at the close of the year was 258. A decision of special note during the year was that on the so-called *Section 16 case*. This adjudication presented the question whether a square mile of oil lands in the Elk Hills field of California was known to be mineral in character at the time of the approval of the official survey, and was, by reason of this fact, excepted from the school land grant made to the State of California under which title had been asserted adversely to the United States. The value of the lands determined to be the property of the United States in this case probably exceeds several millions of dollars. Many of the other appeals considered presented issues of large monetary or social significance.

Title work performed in the office of the Solicitor is summarized in the following table:

Title examinations and reviews.....	820
Formal title opinions.....	68
Condemnation cases and miscellaneous items.....	1,930
Total	2,818

At the end of the year 98 title cases were pending, awaiting examination and review or the preparation of a formal title opinion.

One of the most important and prolonged public land controversies ever to come before the Department or the courts, *United States v. Standard Oil Company of California*, was brought to a successful conclusion during the year, through the affirmance of the decision of the District Court for the Southern District of California by the Circuit of Appeals for the Ninth Circuit, and through the denial of a vigorously pressed petition for certiorari by the Supreme Court of the United States. This action resulted in the quieting of the Government's title to section 36 in the Elk Hills oil field of California, a square mile of valuable oil lands in the geologic center of a naval petroleum reserve, and in the recovery of approximately \$7,137,000 as damages for the oil and gas extracted from that section while adversely held under claim of title.

Another public land controversy of scarcely less importance, in which a favorable decision was rendered by the Supreme Court during the year, was *United States v. City and County of San Francisco*. The decision of the Supreme Court upheld the constitutionality of the provisions of the Raker Act of December 19, 1913, requiring municipal distribution of electric energy produced through the use of the lands and rights-of-way granted San Francisco under that act, as a valid exercise of the power of the Congress to control the disposition of the public domain, and sustained the contention of the Department that the arrangements for the distribution of such energy made by San Francisco were not in conformity with these provisions.

Grazing matters received during the year presented many problems of considerable difficulty. Regulations under the Pierce Act of June 23, 1938, were drafted. Important litigation relating to the authority of the Secretary of the Interior to impose license fees in connection with grazing operations on the public domain was pending at the end of the year.

The making of far-reaching adjustments in the rates charged for electric energy produced at the Boulder Canyon Dam was an outstanding item among the many reclamation problems handled. Another matter of exceptional importance was the preparation and

presentation of the Government's case in *Nebraska v. Wyoming and Colorado*, an original suit in the Supreme Court for an equitable apportionment of the waters of the North Platte River. The United States has formally intervened in this suit in order to protect its claim to the ownership of all unappropriated waters on the public domain and its large investment in reclamation projects on the North Platte River.

The enforcement of the Connally "Hot Oil" Act required a large amount of attention during the fiscal year, and extensive collaboration with the Department of Justice in analyzing evidence of violations and in preparing cases for trial. Fundamental questions concerning the authority of the Department to require companies allegedly engaged in producing oil solely for intrastate consumption to submit reports on their operations were presented in several cases.

During the fiscal year the Solicitor's staff prepared, with the aid of the Department of Justice, a compilation in 46 volumes of all Federal laws and treaties pertaining to Indian affairs, and a comprehensive Handbook of Federal Indian Law, designed primarily to provide administrators, United States attorneys, the Indian tribes and their attorneys with legal guidance on the many complex problems in this field. The handbook was based on an analysis of more than 4,000 statutes and treaties and 5,000 judicial decisions and administrative rulings.

The transfer of the Bureau of Biological Survey, the Bureau of Fisheries, and various other agencies or functions to the Department of the Interior at the beginning of the fiscal year added materially to both the volume and the variety of the work load in the immediate office of the Solicitor.

The quantities and types of legal work having to do with the administration of the Territories and outlying possessions of the United States were measurably enlarged. Matters of a highly diverse character relating to Alaska, Hawaii, Puerto Rico, the Virgin Islands, the Philippines, Canton Island, and Antarctica were passed upon during the year.

Proper determination of the legal questions which arise in connection with the administration of the public domain is largely dependent upon the work of the Law Division of the General Land Office. The total number of matters disposed of by the Division during the fiscal year 1940 was 36,944, as compared with a total of 38,826 matters disposed of during the fiscal year 1939.

Approximately 50 percent of the work handled during the fiscal year related to the issuance and enforcement of oil and gas leases under the Mineral Leasing Act of February 25, 1920. A major problem presented was the validity of certain legal objections raised

by interested parties to a proposed award of potash leases. Issuance of these leases paved the way for increasing the production of potash in the United States to the extent necessary for bringing about national self-sufficiency in this important fertilizer ingredient, which was formerly imported in considerable quantities from Germany, Spain, and other foreign countries. Proceedings instituted by the United States to determine the validity of a number of valuable unpatented oil claims in the Lance Creek field of Wyoming were another item of primary significance. In all, the number of mineral matters handled increased from 22,654 items in 1939 to 23,699 items in 1940.

Recommendations for the institution of suit were made in 16 cases, and sums aggregating \$22,865.26 were recovered through suit. The administrative disposition of trespass matters resulted in the collection of sums aggregating \$18,215.23 in satisfaction of the administrative findings.

The conservation of oil, gas, and other mineral resources absolutely necessary in the conduct of modern mechanized warfare and the utilization of these vital sinews of national defense in the most effective manner were the principal subjects of legal work for the Geological Survey. Military significance also attaches to those aspects of this work which have to do with the topographic mapping of the United States and Alaska, the investigation of water resources capable of producing hydroelectric power, and the protection of inventions adaptable to wartime use made by the scientific personnel of the Department.

This legal work centered in large degree around the task of administering operations under oil and gas leases on the public domain. The number of matters handled increased from 2,271 in the fiscal year 1939 to 2,533 in the fiscal year 1940.

Preparation and negotiation of unit plan agreements designed to bring about the maximum ultimate recovery of oil and gas from each natural operating area formed an important branch of the work. During the fiscal year, 9 unit plan agreements, covering approximately 198,000 acres of oil and gas lands, were completed. One of these involved the principal producing lands of the Salt Creek field in Wyoming from which oil having a gross value in excess of 300 million dollars has already been obtained.

Legal matters relating to the Indians of the United States and to the services and activities of the Federal Government in their behalf covered an extremely diversified range of subjects.

Some indication of the scope of the problems may be afforded by reference to activities in the field of Indian litigation alone

during the fiscal year. In this period 288 cases were referred to the Department of Justice for institution of suit or other appropriate action, 499 cases referred to the Department of Justice were finally closed, while 363 cases were still pending at the end of the fiscal year.

Several suits involving timber operations on Indian lands were successfully concluded during the year, \$177,000 being recovered in a single case. The long-standing controversy over the reasonableness of the 3 percent base deductions made by certain oil companies, when computing royalties on oil extracted from lands of the Osage Indians, to cover losses allegedly sustained on account of sediment, impurities and shrinkage, terminated in a decision favorable to the oil companies in the Circuit Court of Appeals for the Tenth Circuit.

Sixty-nine suits brought by Indian Tribes against the United States were pending in the Court of Claims at the end of the fiscal year. Several such suits were finally disposed of during the course of the year.

During the fiscal year upwards of 25,000 matters required consideration by attorneys assigned to Bureau of Reclamation work. This was approximately 5,000 more matters than were disposed of during the preceding fiscal year.

Twenty-four suits, including one in the Supreme Court of the United States, were completed during the fiscal year, as compared with an average of 18 suits closed during each of the 4 preceding years. Fifty-nine suits were pending at the end of the fiscal year. Water right litigation in particular required much attention by the legal staff. Suits relating to water rights on the Humboldt River were, after considerable difficulty, settled by mutual agreement. At the end of the year important water right litigation affecting the Kendrick, North Platte, Carlsbad, and Yakima Projects was still pending, while proceedings affecting other projects were in the immediate offing.

Approximately 5,000 contracts involving approximately \$70,000,000 were handled during the year. Of special significance were contracts for the sale of power in connection with the Parker Dam Project, and contracts for the acquisition of power sites and the relocation of public utilities in connection with the Columbia Basin Project.

A large volume of legal work pertaining to the national park, monument and parkway system, and to the general recreational planning program carried on by the Federal Government in cooperation with the several States was cared for by the Office of Chief Counsel of the National Park Service. During the fiscal year 1940 more

than 24,000 matters were handled, an increase of approximately 2,000 over the number handled during the preceding fiscal year.

Active acquisition programs were carried on for the Great Smoky Mountains National Park, the Grand Canyon National Park, the Colonial Parkway, and the Olympic public works recreational project. A special office was established in Seattle to handle the numerous individual transactions incident to the Olympic acquisition program.

An important item of achievement was the negotiation of a contract with the city of Williamsburg, Va., granting an easement for the construction of a tunnel to carry the Colonial Parkway beneath several of the city streets. Others were the negotiation of a contract for the purchase of approximately 16,600 acres of land, together with flood rights, for the Great Smoky Mountains National Park, and the negotiation of a cooperative agreement for the management and operation of the old Philadelphia customhouse as a national historical site.

A large part of the work of the legal staff of the Biological Survey during the fiscal year consisted in the examination of titles and the handling of other matters connected with the acquisition of lands for use as bird and game refuges or sanctuaries. Land acquisition transactions completed during the year numbered 148, and involved lands having an aggregate area of 42,000 acres and an aggregate value of \$386,000. At the end of the fiscal year 442 condemnation cases and 251 purchase cases were pending in various stages of completion.

The institution and maintenance of criminal proceedings based upon alleged infractions of the Migratory Bird Treaty Act or other laws administered by the Biological Survey was another important field of work. Approximately 500 cases of alleged violations were submitted to the legal staff for review.

Substantial increases in the tasks of the Legal Division of the Bonneville Power administration occurred during the fiscal year, as work on the transmission system progressed and market outlets became more numerous. Condemnation proceedings against 570 separate tracts of land for transmission line and related purposes were completed during the course of the fiscal year, while proceedings to condemn 611 tracts were pending at the end of this period. Construction and procurement contracts to the number of 702 were passed upon, and approximately 225 claims against the Administrator were examined and disposed of. The Legal Division took part in the drafting and negotiation of power contracts. Outstanding among these were two contracts with the Aluminum Company of America providing

for the sale to that company of a total of 64,000 kilowatts of prime power.

The Legal Division of the Puerto Rico Reconstruction Administration performed numerous legal duties having to do with the conduct of the multisided rehabilitation program being carried on for the benefit of the people of Puerto Rico. The number of land acquisition cases completed during the year was 938, leaving 426 such cases pending at its close. Court actions amounted to 490 in number.

Legislative work was unusually heavy during the fiscal year, due in part to the fact that the Congress was in almost continuous session. During the fiscal year more than 100 laws directly affecting the work of the Department of the Interior were enacted. Some of the more important of these were as follows:

Public No. 407: An act authorizing States owning lands or interests therein acquired from the United States to include the same in certain agreements for the conservation of oil and gas resources.

Public No. 424: An act to establish the Kings Canyon National Park, Calif., to transfer thereto the lands now included in the General Grant National Park, and for other purposes.

Public No. 429: An act to amend the Bonneville Project Act.

Public No. 431: An act granting easements on Indian lands of the Wind River or Shoshone Indian Reservation, Wyo., for dam site and reservoir purposes in connection with the Riverton Reclamation project.

Public No. 445: An act to amend the act authorizing the President of the United States to locate, construct, and operate railroads in the Territory of Alaska, and for other purposes.

Public No. 457: An act to amend section 6 of the Organic Act of Alaska.

Public No. 475: An act to authorize the Secretary of the Interior to permit the payment of the costs of repairs, resurfacing, improvement, and enlargement of the Arrowrock Dam in 20 annual installments, and for other purposes.

Public No. 486: An act for forest protection against the white-pine blister rust, and for other purposes.

Public No. 520: An act to authorize the purchase of certain lands adjacent to the Turtle Mountain Indian Agency in the State of North Dakota.

Public No. 532: An act to authorize the withdrawal of national-forest lands for the protection of watersheds from which water is obtained for municipalities, and for other purposes.

Public No. 565: An act to confer jurisdiction on the State of Kansas over offenses committed by or against Indians on Indian reservations.

Public No. 566: An act to amend the act of June 30, 1936 (49 Stat. 2041), providing for the administration and maintenance of the Blue Ridge Parkway, in the States of Virginia and North Carolina, by the Secretary of the Interior, and for other purposes.

Public Resolution No. 79: Joint resolution to authorize compacts or agreements between or among the States bordering on the Atlantic Ocean with respect to fishing in the territorial waters and bays and inlets of the Atlantic Ocean on which such States border, and for other purposes.

Public No. 586: An act to provide for the establishment of the Cumberland Gap National Historical Park in Tennessee, Kentucky, and Virginia.

Public No. 593: An act to authorize the Secretary of the Interior to convey to the State of North Carolina for use in connection with the Blue Ridge Parkway certain land within the Cherokee Indian Reservation in the State of North Carolina.

Public No. 597: An act to transfer certain Indian lands to the Grand River Dam Authority, and for other purposes.

Public No. 636: An act to extend the time limit for cooperation between the Bureau of Reclamation and the Farm Security Administration in the development of farm units on public lands under Federal Reclamation projects.

Public No. 689: An act to amend the act entitled "An act to provide for the establishment of the Cape Hatteras National Seashore in the State of North Carolina, and for other purposes," approved August 17, 1937 (50 Stat. 669).

Public No. 690: An act for the acquisition of Indian lands for the Grand Coulee Dam and Reservoir, and for other purposes.

CONCLUSION

The legal services rendered the Department of the Interior and its various bureaus and offices by the Office of the Solicitor during the fiscal year 1940 were of greater magnitude than ever before. The legal and factual issues which had to be coped with were in many instances inordinately complex. A new peak was reached in the numerical volume of matters received and considered. The essential need of the Office of the Solicitor is for additional personnel to carry on its ever-widening circle of tasks.

BITUMINOUS COAL DIVISION ¹

H. A. Gray, *Director*

ON October 1, 1940, minimum prices and marketing rules and regulations for the stabilization of the marketing of bituminous coal produced throughout the United States became effective.

Market stabilization is prescribed by the Bituminous Coal Act of 1937 as a means of relieving the economic ills which have pervaded the coal industry for nearly 20 years. The grave social and economic consequences of the conditions in this industry affect the entire nation; they are described in the reports of the many extensive public investigations and studies which ultimately led to passage of the Coal Act.

The minimum prices are designed to maintain a "cost floor" under the prices at which coal may be sold at the mine and to prevent the incessant price-cutting which has kept the coal markets demoralized. The marketing rules are designed to prevent evasion of the minimum prices and to implement the prohibitions against unfair trade practices which Congress wrote into the law. They cover the sale of practically all of the coal produced in the country.

CONDITION OF THE COAL INDUSTRY

Although the demand for coal now greatly exceeds that of any recent period and this year's production is expected to equal or to exceed that of any other year in the past decade, the market prices of coal generally have not responded to the stimulus of increased buying.

When the losses and gains of the coal industry are counted, it will be found that right up until the very day minimum prices became effective, the industry continued to sell a large part of its production at prices substantially below cost. It has been forced to do this for many years in the past.

The effect of demoralized coal markets upon the financial status of the coal industry is vividly shown by the income tax reports on file

¹ Pursuant to Reorganization Plan No. II, effective July 1, 1939, and orders of the Secretary of the Interior issued in accordance therewith, the Division, by and through its Director, administers the functions vested by the Bituminous Coal Act of 1937 in the National Bituminous Coal Commission, which was abolished by Reorganization Plan No. II.

at the United States Bureau of Internal Revenue as reported by the National Coal Association. They reveal that the coal industry has suffered a net deficit amounting to millions of dollars each year since 1927. This annual deficit has ranged from a high of over \$50,000,000 to a low of more than 7½ million dollars. No statistics are available for the years of 1926 and 1927, but those for 1925 show a net deficit of more than \$22,000,000.

This terrific financial drain upon the coal industry, which has continued to the present day, has been at the roots of the social and economic problems presented by the coal industry and felt generally throughout the United States.

COAL ACT CONSTITUTIONAL

The condition of this industry was the subject of comment by the Supreme Court of the United States in its decision upholding the constitutionality of the Coal Act. This decision was handed down in the case of *Sunshine Anthracite Coal Co. v. Adkins* on May 20, 1940. (A more detailed account of this case is contained elsewhere in this report.) The Court, quoting the late Justice Cardozo with approval, pointed out that free competition in the coal industry had "degraded into anarchy" and that

"Overproduction and savage competitive warfare wasted the industry. Labor and capital alike were the victims. Financial distress among operators and acute poverty among miners prevailed even during periods of general prosperity."

Although the circumstances and conditions of the long depression in the coal industry have many aspects, it can be simply stated that the most significant fundamental condition of the coal industry which has led to the minimum price legislation is the fact that the industry's productive capacity has been far in excess of the demand for bituminous coal. The factor of decreasing market for coal is attributable in large measure to the increased and increasing efficiency in the use of coal and also in part to the availability of competitive forms of energy.

PRICES KEPT BELOW COST

The Director of the Coal Division, in his Findings of Facts accompanying the minimum price determinations, dated August 8, 1940, stated:

"The excess productive capacity, coupled with constant or diminishing demand, sent prices down. For various reasons producers would sell coal below cost. * * *. As one of many raw materials, coal does not bulk large in most manufacturing costs. Although demand is variable, its substantial variations are not proportionate to changes in price, but are influenced primarily by general business activity.

"* * * producers cut prices in order to dispose of their coals. Indeed for long periods during the past two decades, the industry realized less than its average cost of production. And the bituminous coal industry is unlike some industries in which production tends to adjust itself with some flexibility to demand.

"Coal producers commonly continue to produce coal, though realizing less than the cost of production, because of the high cost of temporarily shutting down a mine—due to taxes and possibly royalties, and to the expenses of physical repairs in reopening a mine. Production below cost, therefore, is the condition of many producers who continue as long as they have the resources to carry on in some fashion and as long as they can continue to hope that the condition of the coal industry, or their individual fortunes, may be ameliorated. In appraising the force of this aspiration, we should not overlook the homely truths that man awakens slowly to adversity and that hope springs eternal in the human breast. Moreover, persons trained in one industry cannot lightly abandon it and take up another."

NOT REMAKING INDUSTRY ANEW

The Director of the Coal Division, in the Findings of Facts, stated that the administrative agency "was not instructed, and it has not attempted, to remake the industry anew, or to set prices upon its conception of industry efficiency or the advantages of a planned economy."

The minimum prices must yield the industry an income equal, as nearly as possible, to its average cost and must reflect the relative values of the different coals and other competitive factors. The Director pointed out that Congress intended that the minimum prices should preserve for the coal producers the "fair" competitive opportunities to sell their coal which they enjoyed under unregulated competition. However, he said, the Coal Act necessarily eliminates the "competitive opportunity" of producers to attempt to make inroads on markets by price cutting resulting in lowering the coal industry's income below its average cost. It also eliminates the "competitive opportunity" to make sales by means of dumping, the sale of "distress coal," manipulations resulting in discriminations between individual consumers in the same market, and "all the other chaotic forces which were present in bituminous coal markets under free and open competition."

The minimum prices and marketing rules, therefore, were formulated with these standards of Congress in mind.

COAL VITAL TO NATIONAL DEFENSE

The bituminous coal industry, whose financial stability and economic security the Coal Act seeks to bring up to a par with American industry in general, is vital to national defense. The stability of this industry, therefore, is of paramount public importance. Bituminous coal furnishes approximately half of the Nation's total of all energy

derived from minerals and water power. (This total energy includes gasoline and oil consumed in internal-combustion engines.) It furnishes approximately 85 percent of all fuels and energy consumed by the railroads, 49 percent of that used by electric public-utility power plants, and about 75 percent of that used by general manufacturing plants.

Bituminous coal is a basic material used in the manufacture of steel. It is the raw source of hundreds of other commodities, such as explosives, medicines, paints, plastics, chemicals, artificial silk and rubber, etc. Many commodities, necessary to national defense, which the country formerly had to import from across the seas now may be synthetically manufactured from bituminous coal, thus contributing greatly to our national security.

In addition to the effect that strengthening of the coal industry will have upon immediate national defense needs, the placing of coal marketing upon a stable basis is expected to have an important bearing upon future national security. The conservation of our present known deposits of excellent coals, necessary for present industrial uses, is imperative to the future security of the nation.

The Committee for Mineral Policy of the National Resources Board, after a study, in 1933 reported that the great underlying cause of the excessive waste which is depleting prematurely these limited coal deposits is "destructive competition." This is the sort of competition which the minimum prices and marketing rules and regulations are designed to eliminate. Stabilization of coal markets will remove, then, one of the fundamental causes of excessive waste.

WASTE IS TREMENDOUS

Numerous authorities have pointed out that although America has huge coal deposits, the life of the beds of finer and more cheaply produced coals, such as those upon which the manufacture of steel and many other commodities depend, is limited. Their conservation is considered of immediate public concern. Mining now is concentrated in these deposits. The waste in mining bituminous coal in the United States has been authoritatively estimated to be approximately 35 percent of the coal exploited, as compared to a waste of from 5 to 10 percent in western Europe. This was shown by field studies in 1923 by engineers of the United States Bureau of Mines and the United States Coal Commission, headed by the late John Hays Hammond, internationally known mining engineer.

The Mineral Policy Committee of the National Resources Board stated, in 1934, that with the use of standards of engineering already shown to be feasible by the practice of the better companies this loss

could be reduced to 15 percent of the coal exploited. This means that the loss of 20 percent of the coal exploited could be prevented. The annual avoidable loss has been placed as high as 150,000,000 tons of coal, left behind in the mines under conditions that virtually prevent its being recovered thereafter. Coal Division research experts have computed that this is enough coal to equal the combined annual normal coal requirements of Italy, Spain, France, Belgium, and Holland, with Scandinavia thrown in for good measure.

CONDITIONS GREW WORSE

The National Resources Board report for 1934 stated that conditions then were worse than at the time the studies were made by the Bureau of Mines and the United States Coal Commission. In 1934, in connection with the antitrust suit brought by the Government against Appalachian Coals, Inc., Howard N. Eavenson² gave the following testimony which is quoted in the report:

"I think I could make the broad assertion that there is not a single bituminous mine in the country today that is not mining the very best coal that it has, and the cheapest, and is allowing portions of the mine to get into shape where a lot of the coal will never be recovered, because they cannot afford, at present prices, to mine it."

This preventable waste can readily be seen to be hastening the depletion of these necessary coal beds. To meet price-cutting competition, under unregulated markets, there has been a tendency in the coal industry to cheapen production costs by mining only the coal which could be extracted at the least expense. Coal which could be recovered and sold competitively under stable market conditions is left in the mines, where it becomes unrecoverable. The premature closing of mines, due to bankruptcies and cessation of business, also is responsible for leaving in the ground unmined coal destined to become permanent waste.

The Mineral Policy Planning Committee of the National Resources Board pointed out in a report in 1934 that only a financially stable company can afford competent engineers and adequate technical supervision; that is an important factor, since large tonnages are lost in squeezes due simply to lack of engineering control.

This committee reported in 1934 that the famous smokeless beds in southern West Virginia would last but 85 years, at the 1929 production rate, while the highest grade gas and metallurgical coals were 11 percent exhausted in Kentucky and 22 percent exhausted in southern West Virginia and Virginia. The life of the Pittsburgh bed in Pennsylvania was limited to 100 years. These coals, the committee stated, "are

² At that time Mr. Eavenson was president of the American Institute of Mining and Metallurgical Engineers.

the foundation of the American steel industry and their depletion will handicap not only steel itself but all industries depending on steel."

COOPERATING IN NATIONAL DEFENSE

In addition to the immediate and future effect that the stabilization of coal markets is expected to have upon national security, the Coal Division is and has been cooperating with the agencies administering the national-defense program. From its vast store of statistical data concerning the coal industry, the Division is furnishing information whenever requested in connection with the defense program. The Division will continue to provide this cooperation whenever called upon in the future.

Available for the purpose of facilitating the efficient distribution of coal in any emergency is the greatest store of statistical information about the coal industry that has ever been amassed for any industry. It was compiled in the administration of the Coal Act and in establishing minimum prices and marketing rules and regulations.

This information covers every important problem concerning the distribution and marketing of bituminous coal, including the present and potential availability of specific kinds, grades, and sizes of coal. It includes transportation charges and available or potential transportation methods and facilities. It shows the cost structure of the industry, down to each particular mine.

In addition, the Division has a staff of trained technicians, experienced in the marketing and distribution of coal.

MINIMUM PRICES NOW IN EFFECT

The Bituminous Coal Act became a law in the spring of 1937. It was not practicable for Congress to provide detailed schedules containing minimum prices for each kind, quality, and size of coal which each of the more than 13,000 producers mine and ship into the various markets they serve. This constituted a highly intricate and technical process. It required a great amount of time and a tremendous amount of work by a large force of highly skilled technicians. It was completed and the minimum prices and marketing rules were made effective on October 1, 1940.

DIVISION TOOK OVER WORK

The work of establishing the minimum prices originally was begun by the National Bituminous Coal Commission. The difficulties the Commission met are well known. The Bituminous Coal Division took over the work on July 1, 1939, pursuant to the provisions of the Reorganization Act of 1939 which abolished the Coal Commission.

The Division proceeded with the view firmly in mind that the initial price structure must be as perfect as it can be made. Although the law provides for the adjustment and alteration of minimum prices after they become effective, the importance of the prices to the coal industry, and the coal-buying public demanded that the initial schedules be carefully devised. The Division, therefore, of necessity, proceeded with great care and deliberation, but as rapidly as circumstances would permit.

At three separate stages in the procedure, the proposed price structure was published and an opportunity given for interested persons to point out their objections and seek changes. First, in the extensive public hearing which provided the basic legal record upon which the prices were established, the Division received the protests against the minimum prices proposed by the Coal Commission. The recommendations of the Division's trial examiners, who presided at the hearing, then were published. Objections to these were considered by the Division Director, in his study of the examiners' report. Then the Director's determinations were published, and objections to these were received and considered by the Secretary of the Interior. The order of the Director had provided that the prices and marketing rules were to become effective subject to review by the Secretary of Interior.

A more detailed account of the price establishment procedure will be contained elsewhere in this report.

RESULTS CANNOT YET BE RELATED

The results of the establishment and making effective of minimum prices and marketing rules, of course, cannot be forecast with certainty until more experience is had thereunder.

The Division now has entered upon a new phase of its work. Its activities will be concentrated on insuring compliance with the minimum prices and marketing rules and making such adjustments in them as may be required from time to time.

To meet the demands of this new phase of its work, the Division has changed the basic organization of its staff. The task of securing compliance with the minimum prices for coal at the mines and of preventing unfair trade practices involves the use of personnel in both the producing and consuming areas. To provide for the cooperation of the district boards with the Division in compliance, special arrangements have been made for the interchange of information and investigation. The district boards have with substantial unanimity offered their assistance.

Proper investigation of alleged violations and consideration of requests for substitution permits will require study of invoices and

the compilation and study of machine runs of abstracted invoices. The statistical work, also necessary in connection with appropriate disposition of petitions for revision of prices, may be expected to equal the amount of work entailed in the establishment of prices.

Although the price schedules have been made effective, they cannot be considered as a static, accomplished task requiring no further adjustment. To a degree even greater than the freight-rate structure of the Nation, they will require constant attention to meet changing conditions, including changes in methods of transportation.

INDUSTRY COOPERATES

The Division has every reason to believe it will meet with even more cooperation from the coal industry in the compliance program than it has received in the formulation of the prices.

The Division must constantly seek to ascertain the extent to which the individual units of the coal industry are complying with the prices and marketing rules through analysis of the copies of invoices, credit and other sales memoranda and data which producers are required to file.

Complaints, charging violation of the minimum prices, will be received in the field offices, and promptly investigated either by the Division's investigators or those of the producers' boards, or both.

BOARDS' PART IMPORTANT

The bituminous coal producers' boards, whose membership consists of representatives of the coal industry and labor, will play an important part in the compliance program, just as they played in the price formulation program. Not only will they continue to play a part in the pricing process from time to time, and discharge other duties as provided by the Coal Act, but they will cooperate in the filing of and investigation of complaints charging violations of the minimum prices. This will not, however, relieve the Division's field force of its investigatory duties.

Machinery has been set up for the holding of public hearings on complaints charging violations. Public hearings also will be necessary from time to time in carrying out other functions in administration of the Coal Act, including the making of adjustments in the minimum price structure when necessary under section 4 II (d) of the Coal Act. Such hearings will continue to necessitate the compilation of much statistical data as in the past.

The Division must maintain a close watch on the costs of the coal industry, as the Coal Act requires that adjustments in the prices be made upon satisfactory proof that the weighted average costs of producing and selling coal have changed as much as 2 cents a ton.

SUBSTITUTIONS ARE PROVIDED

Many problems must be met in the administration of the minimum prices and the Marketing Rules and Regulations. For example, there is the problem of handling substitutions, i. e., the filling of an order or contract for the sale or delivery of coal by a grade, size, quality, preparation or treatment of coal which takes a higher minimum price than that specified in the order or contract. In the operation of a coal mine it occasionally becomes necessary to substitute a different coal from that which has been ordered. This may be due to congestion of loaded railroad cars at a producer's tippie, requiring immediate shipment of certain coals in order to permit the continued operation of the mine. A similar emergency may arise when unordered coal is produced or is about to be produced as a consequence of the production of coal to fill orders for certain sizes. A peculiarity of the business of mining coal is that a producer cannot control production so as to produce a single size of coal for which he may have orders. Coal must be blasted out of its natural geological formation or mined with such heavy machinery that all kinds of sizes result from the mining operation. Substitutions are not permitted by the Marketing Rules and Regulations, except in certain instances and in accordance with a definite procedure. This procedure requires that substitutions may not be made unless an application for a substitution permit has been filed with the statistical bureau of the district and a substitution permit issued after approval by the Director or his designated representative.

TWELVE THOUSAND THREE HUNDRED CODE MEMBERS

The minimum prices and marketing rules apply to the coal sold by producers who have become members of the Bituminous Coal Code. More than 12,300 producers who mine substantially all of the bituminous coal produced in the United States have become code members.

Before prices became effective there were only a few producers throughout the country who had not become members. Although their combined production has not been computed, it is estimated to be insignificant. Its effect in the coal market will be negligible. Such producers may sell coal at whatever prices they choose, but the Coal Act levies a 19½-percent tax on each sale.

Code members must sell their coal at not less than the established minimum prices and in accordance with the Marketing Rules and Regulations. Failure to do so will subject a code member to loss of code membership, in which case his sales of coal will be taxed 19½ percent, payable to the United States Treasury. To regain

his code membership he must pay double the 19½-percent tax of the sales price on all coal sold in violation. Furthermore, if a code member's violation results in injury to the business or property of another code member, the latter is entitled to recover triple damages in a suit brought in any court of competent jurisdiction. As an alternative to code revocation, the Division, through its Director, may issue a cease and desist order against a code member violator which, if not obeyed, is enforceable by any Circuit Court of Appeals or the Court of Appeals for the District of Columbia upon application by the Division. A producer whose code membership has been revoked may not be a member of a marketing agency and thus cannot participate in voluntary cooperative marketing agreements in accordance with section 12 of the act.

SALES AGENTS GOVERNED

Sales of coal by code members through their sales agents are governed by the Marketing Rules and Regulations. These are designed to insure that sales agents observe the minimum prices and all other applicable rules and orders. If a code member fails to require his sales agent to abide by the established minimum prices or the Marketing Rules and Regulations, he commits a violation of the code and becomes liable to the applicable penalties. If a sales agent does not agree to conform to and observe the applicable provisions of the Marketing Rules and Regulations, the act, proper orders of the Division and the established minimum prices, or fails to comply with such an agreement, he cannot be allowed or paid a commission by a code member.

The marketing of coal through distributors and farmers' cooperative associations also is regulated. Code members may grant discounts from the minimum prices only to distributors and farmers' cooperatives which have been registered by the Division.

Registered distributors and cooperatives are required to sell coal at not less than the minimum prices established. The Division, after conducting a public hearing, prescribed the maximum discounts which code members may make to registered distributors and farmers' cooperatives, and promulgated rules and regulations for their registration.

Regional marketing agencies, which may be approved by the Division under section 12 of the Coal Act, also are required to sell the coal of their members at not less than minimum prices. The Division has granted provisional approval to 13 of these agencies.

THIRTY-NINE EXEMPTIONS GRANTED

Under provision of the Coal Act, exemptions from the minimum price regulations have been granted in 39 cases in which the coal is consumed by the producer.

The regulatory provisions of the law do not apply to bona fide written contracts entered into prior to June 16, 1933. The Division required all such contracts to be filed with it, and made a careful investigation in each case to ascertain whether the contract in question was a lawful and bona fide written contract entered into prior to June 16, 1933.

PROCEEDINGS FOR ESTABLISHMENT OF MINIMUM PRICES AND MARKETING RULES AND REGULATIONS

As previously stated, the means adopted by Congress to stabilize the coal industry is through a system of minimum prices, f. o. b. transportation facilities at the mines applicable to code members in the sale of their coal. The minimum prices are supplemented by standards of fair competition which must be observed by code members and by rules and regulations governing the marketing of coal.

The prices have been established after full hearings for all concerned. This procedure, as well as the complex nature of the task, made the process of determining prices a slow one.

PROCEEDINGS INSTITUTED BY THE COMMISSION

In order to meet, with the greatest dispatch, the critical situation existing in the coal industry, minimum prices were established by the Commission in December 1937. However, these prices were revoked by the Commission in February 1938 after the Court of Appeals for the District of Columbia had issued certain temporary restraining orders, which threatened a general break-down in the price structure. The court stated, without finally deciding, that the required opportunity to be heard had not been given before these prices were made final. Detailed hearings in General Docket No. 15 on all the phases of the price-fixing process were then begun as soon as possible. The time consumed in the various phases of the proceedings is attributable to the magnitude of the task, to the care which has been taken to assure the correctness of the result, to complex procedural requirements of the law, and to litigation instituted during the proceedings. Moreover, in all the hearings full opportunity was given to all district boards, all producers, and the Consumers' Counsel, as well as all other interested parties, to offer evidence and proposals of their own and to cross-examine all witnesses.

The fixing of prices may be classified in three phases: First, the weighted average of the total costs of the ascertainable tonnage in each of the minimum-price areas is determined; second, minimum prices and marketing rules and regulations are determined in conformity with standards set forth in the act to serve as a basis for coordination among the districts; third, these minimum prices and marketing rules and regulations are coordinated in common markets in accordance with the standards set forth in subsections (a) and (b) of part II, section 4, of the act and become the effective minimum prices and marketing rules and regulations.

At the time of its abolition on July 1, 1939, the Commission had completed proceedings for the determination of the weighted average cost of production and sale; it also had completed the proceedings concerning the determination of minimum prices and marketing rules and regulations to serve as a basis for coordination among the districts; it had not completed the task of coordination of these prices and rules.

CONTINUATION OF PROCEEDINGS BY THE DIVISION

Final hearings on coordinated minimum prices were begun by the Commission in May of 1939 and were continued before examiners of the Division commencing July 24, 1939, and lasting until January 20, 1940.

A detailed account of these proceedings from the beginning of General Docket No. 15, up to and including the phases completed and in progress as of November 1939, is contained in Third Annual Report under the Bituminous Coal Act of 1937 (U. S. Government Printing Office, Washington, 1940).

EXAMINER'S REPORT—EXCEPTIONS THERETO AND ARGUMENT BEFORE DIRECTOR

The taking of testimony before the examiners of the Division in General Docket No. 15 was concluded on January 20, 1940. The record of these proceedings contains over 26,000 pages of testimony and oral argument, about 2,000 exhibits, about 700 written protests and 112 briefs. More than 300 producers, consumers, and other interested persons were represented at the hearing. The examiners heard oral argument on February 14, 15, and 16, 1940. They filed part of their report on March 21, 1940, and the remainder on April 13, 1940.

Five hundred and eighty-one parties filed exceptions and briefs to the examiner's report. Forty-eight parties requested a review by the Director of the findings and conclusions of the Commission on vari-

ous phases of the proceedings. Nearly 300 parties were afforded oral argument before the Director during the period from May 27 to June 6, 1940. Several miscellaneous motions and other moving papers were filed by parties subsequent to the filing of the examiner's report.

ESTABLISHMENT OF MINIMUM PRICES AND MARKETING RULES AND REGULATIONS

On August 8, 1940, the Director, having made findings of fact and conclusions of law, established minimum prices as set forth in schedules which had previously been mailed to appropriate persons by August 3, 1940. These prices were to become effective on September 3, 1940, together with Marketing Rules and Regulations and schedule of common consuming market areas.

REVIEW BY SECRETARY OF THE INTERIOR

Under rules of procedure promulgated by the Director, with the approval of the Secretary of the Interior, interested parties were afforded a period of 10 days from the date of issuance of the Director's findings of fact and conclusions of law to file with the Secretary of the Interior exceptions thereto and a request for review of the Commission's findings and conclusions.

Several parties filed motions with the Secretary requesting that the period within which to file exceptions be extended for certain periods of time. The Secretary extended this period to August 30, 1940. In view of this action the Director postponed the effective date of the minimum prices and marketing rules and regulations until October 1, 1940.

More than 100 parties filed with the Secretary exceptions to the Director's findings of fact and conclusions of law. There were several requests filed for a review of various phases of the Commission's findings and conclusions and other relief.

EFFECTIVE DATE OF MINIMUM PRICES AND MARKETING RULES AND REGULATIONS

Prior to October 1, 1940, the Secretary had passed upon the exceptions and requests for review. The minimum prices and marketing rules and regulations went into effect on October 1, 1940. As this report was going to press, the Division was engaged in receiving, passing upon, and hearing petitions filed in accordance with section 4 II (d) of the act, by interested parties, who were dissatisfied with the minimum prices or marketing rules and regulations. Under this section of the act temporary relief may be afforded to an interested

party, upon a proper showing and pending final disposition of a petition. During the brief period from December 16, 1937, to February 25, 1938, when minimum prices were formerly in effect, more than 300 of these petitions were received by the Commission.

CONSTITUTIONALITY OF THE ACT

On May 20, 1940, the Supreme Court of the United States, with Mr. Justice McReynolds dissenting, declared that the Coal Act was constitutional in the case of *Sunshine Anthracite Coal Company v. Adkins* (60 Sup. Ct. S. C. 907). This case involved a suit by a non-code-member producer, originally filed in a three-judge statutory Federal district in Arkansas, to enjoin the collection of the 19½ percent excise tax. The Sunshine Co. asserted that its coal was not bituminous within section 17 (b) of the Coal Act and that even if it were the collection of the tax should be enjoined since the act was unconstitutional. (Subsequent to the filing of this suit the Circuit Court of Appeals for the Eighth Circuit had ruled in a separate proceeding that the company's coal was bituminous and the Supreme Court denied certiorari.)

Some of the important points in the opinion of the Supreme Court are as follows:

1. Constitutionality of Regulatory Provisions

(a) *Power under the commerce clause.*—The opinion holds the various regulatory (code) provisions of the Coal Act, limited to sales in or intimately affecting interstate commerce, to be within the power of Congress to regulate interstate commerce. "The fixing of prices, the proscription of unfair trade practices, the establishment of marketing rules respecting such sales of bituminous coal constitute regulations within the competence of Congress under the commerce clause."

(b) *Due process.*—The opinion holds that price control is a means available to Congress "for the protection and promotion of the welfare of the economy." The opinion states that conditions in the coal industry were certainly so chaotic as to justify Federal intervention, and that Congress, in undertaking regulation, could fashion a flexible remedy and stabilize the industry through price-fixing by an administrative agency safeguarding the public interest.

(c) *Delegation of legislative power as to price-fixing.*—The Court considered the standards set forth in the act, both as to minimum and as to maximum prices, and upheld these standards as being sufficiently specific and definite to guide administrative action. The Court stated that the language was clearly sufficient for experts. The Court gave fresh doctrinal impetus toward permitting delegation by stating that a requirement of greater specificity would intrude upon the administrative process.

2. Validity of the 19½ Percent Tax Provision

To the objection that the 19½ percent tax imposed under section 3 (b) of the act is a penalty and not a tax, the Court stated that although the tax is not imposed for revenue purposes, but to compel compliance with the regulatory

provisions, Congress could use the power of taxation as a means of enforcing provisions valid under the commerce clause.

The company argued that the act should be construed so that the 19½ percent tax was not applicable to noncode members. The Court rejected this strained construction, and held the tax applicable to precisely the noncode members.

The company objected, in the alternative, to the "discrimination" in laying the 19½ per cent tax on noncode members but not upon code members. The Court pointed out that this distinction was the very scheme of the act, and that the Government could always discriminate against (i. e., penalize) persons not complying with regulations.

3. Status of Sunshine Coal as Bituminous

The Sunshine Anthracite Coal Co. filed a petition for review in the Circuit Court of Appeals for the Eighth Circuit, claiming that the determination of the Commission that its coal was "bituminous" was erroneous and beyond the jurisdiction of the Commission. The circuit court of appeals upheld the jurisdiction of the Commission to determine that issue, and held that its findings was supported by substantial evidence. The Supreme Court denied certiorari.

In this suit, brought to enjoin the Collector of Internal Revenue from collecting the 19½ percent tax, the company contended that the former decision was not binding, since the parties were different, and since this case presented a different issue, one of tax liability.

The Supreme Court decided in favor of the Government on various grounds. First, the Court said that the Coal Commission is the agency designated to determine what coal is subject to the act, and that the Commissioner of Internal Revenue is merely an agent of tax collection. The Court also held that the first decision was binding and conclusive of this "bituminous issue" in the second proceeding, on the ground that the issues were the same and the parties were the same in substance, if not in form. The Court pointed out that the Coal Commission had authority to represent the interests of the United States in the first proceeding, and that, therefore, the question could not be relitigated against another subordinate official of the United States. Finally, the Court held that there was no jurisdiction to consider the "bituminous issue" on a suit for injunction, since the statutory remedy (of appeal to the circuit court of appeals) is exclusive. The ground as stated is extremely significant with respect to the administration of the Coal Act, since it limits any judicial review of the Division's orders to the circuit courts of appeals, and precludes litigation in the various district courts.

4. Injunction

The lower court issued a permanent injunction against the collection of taxes accruing prior to December 4, 1939, but did not extend that injunction. The company argued that it was entitled to contest the constitutionality of the act without being subject to a heavy penalty during the period of litigation. The Supreme Court stated that such relief against payment of the taxes "until final termination of the litigation would be to put a premium on dilatory tactics" in a situation where constitutionality was clear.

OTHER LITIGATION

During the period covered by this report, every case brought to conclusion in the courts has been decided in favor of the Division.

In the case of *City of Atlanta v. National Bituminous Coal Commission* (60 Sup. Ct. 170) the Supreme Court on November 13, 1940, in a per curiam opinion, affirmed the judgment of the lower court, holding that the appellant was without standing to maintain the suit.

This case had originated in a suit before a three-judge statutory court in the United States District Court for the District of Columbia. The city of Atlanta assailed the constitutionality of the Bituminous Coal Act of 1937 and prayed that the Commission be enjoined from establishing minimum prices on the coals sold to it and further prayed a declaratory judgment announcing the legal rights of the parties under the act.

The district court dismissed the bill of complaint. It assumed that the constitutional question was properly presented, and upheld the constitutionality of the Coal Act. The court held that the power to regulate interstate commerce embraced the authority to establish the price of commodities sold in interstate commerce; that Congress had not violated the due-process clause by providing for the fixing of prices in the coal industry, an industry of fundamental importance and characterized by chaotic marketing conditions; that the standards provided by the act were not constitutionally defective as indefinite; and that the act could be applied to sales of coal to the city of Atlanta without infringing on its sovereign powers contrary to the tenth amendment.

Upon direct appeal to the Supreme Court, the Government supported the constitutionality of the act, and also renewed its initial objections; that the suit was premature since prices had not been fixed; that there was no equity jurisdiction since the act itself provided plaintiff with an adequate remedy; and that the plaintiff was merely a consumer of coal and therefore had no standing to attack the Coal Act which imposes sanctions only upon producers of coal.

The case of *Winslow Coal Corporation v. Smith*, decided April 12, 1940, by a three-judge statutory court convened in the District Court of the United States for the Southern District of Indiana, also involved the constitutionality of the act.

In this proceeding a suit was brought by the Winslow Coal Corporation against Will H. Smith, as Collector of Internal Revenue for the District of Indiana, in which an injunction was asked against the collector to restrain him from collecting the taxes imposed by sections 3 (a) and (b) of the act upon the plaintiff, a producer of coal, on the ground that the act was unconstitutional.

The court sustained a motion for summary judgment filed by the Government and dismissed the complaint, holding that the 1 cent per net ton excise tax imposed by section 3 (a) of the act

constituted a valid excise tax, and that it was without power to grant an injunction against the collection of the tax provided in section 3 (a) of the act.

As indicated above, an important case was brought to a conclusion by the Supreme Court of the United States, when it denied certiorari on November 6, 1939, in the case of *Sunshine Anthracite Coal Co. v. Ickes, et al.* (60 Sup. Ct. 142), and refused rehearing on December 4, 1939 (60 Sup. Ct. 260). The petition for certiorari was filed by the Sunshine Co. seeking a review of the decision of the Circuit Court of Appeals for the Eight Circuit in upholding the Commission's determination that certain coal was bituminous within section 17 (b), in *Sunshine Anthracite Coal Co. v. National Bituminous Coal Commission* (105 F. (2d) 559), decided June 19, 1939.

The petition for review in the *Sunshine case* was filed by a non-code-member producer who claimed that its coal was not bituminous and also claimed that this question was one for decision by the courts and not the Commission.

The court held that sections 2 (a) and 4-A of the act constituted authority for the Commission's regulations, providing for an ascertainment of the status of coals, and established the Commission's jurisdiction to determine whether coals are subject to the act. The court also upheld the Commission's refusal, under the circumstances present, to permit the producer to withdraw its application for exemption. Upon the merits, the court affirmed the Commission's finding that the coal was bituminous, and upheld the Commission's order as being supported by substantial evidence.

The above case, *Sunshine Anthracite Coal Co. v. Ickes*, is one of several cases involving applications for exemption filed by producers, on various grounds, e. g., that the coal is captive coal, being consumed by its producer, that it moves in intrastate commerce, that it is not bituminous, etc. The act contemplates that judicial consideration of the validity of the Commission's denial of exemption will be obtained by filing a petition to review in the appropriate Circuit Court of Appeals, pursuant to section 4-A and section 6 (b) of the act.

Another exemption case, *Northwestern Improvement Company, Petitioner, v. Ickes, et al.* (111 F. (2d) 221), decided April 25, 1940, by the Circuit Court of Appeals for the Eight Circuit, was resolved favorably to the Government. The petitioner was unsuccessful in its claim that there is no interstate commerce in coal, or commerce covered by the Coal Act, in its sales to its parent company, the Northern Pacific Railway Co., on the ground that title to the coal passes within the State where the mine is located and that thereafter the

coal is transported by the consumer thereof. The petitioner did not seek a review of this decision.

Two cases, *Cook v. Yoke* and *Craig v. Yoke*, in the District Court of the United States for the Northern District of West Virginia were dismissed by stipulation on May 17, 1940. These cases were brought by noncode members who contested the application of the act to their intrastate sales within the State of West Virginia. After filing these suits the producers decided to accept the code and the producers and the Government mutually agreed to dismiss the suits.

PENDING AND PROSPECTIVE LITIGATION

With the exception of two cases involving denial of applications for exemption, the Division, by September 15, 1940, was clear of all litigation with which it had to contend during its first year of the administration of the Coal Act. During this period 7 cases were disposed of, all favorably to the Government. It is expected, however, that a considerable amount of litigation will arise as a result of interested persons seeking court review of various matters involved in the establishment of minimum prices and other proceedings relating thereto. The number of such cases cannot be foretold at this time; about 25 cases were filed attacking the first price structure established by the Commission on December 16, 1937, and in effect only until February 25, 1938.

BOARD ON GEOGRAPHICAL NAMES

George C. Martin, *Executive Secretary*

THE UNITED STATES BOARD ON GEOGRAPHICAL NAMES is the organization through which the Federal Government provides for uniform usage in the form, spelling, and application of those geographic names that are used on maps and charts and in publications issued by the Government.

The Board is continuing work begun in 1890, when an informal interdepartmental committee was organized for the purpose of bringing about uniformity in geographic names used in the publications of the bureaus represented. That committee was given legal status in 1890, when President Harrison designated its members as a Board on Geographic Names and defined its authority. The name of the organization was changed in 1906 to the United States Geographic Board. It operated under that name until 1934, when its functions were transferred to the Department of the Interior.

The Board consists of an advisory committee, in which various governmental departments and geographic societies are represented, which acts chiefly through its executive committee, and of an administrative and investigative unit, called the Division of Geographic Names, in the office of the Secretary of the Interior. The personnel of the advisory and executive committees, on June 30, 1940, was as follows:.

ADVISORY COMMITTEE

Lt. Comdr. K. T. Adams, Coast and Geodetic Survey, Department of Commerce.

Mr. Roscoe E. Baber, foreign language editor and translator, member Style Board, Government Printing Office.

Mr. Clarence Batschelet, geographer, Bureau of the Census, Department of Commerce.

Mr. James M. Darley, chief cartographer, National Geographic Society.

Mr. E. E. Carter, Chief, Division of Timber Management, Forest Service, United States Department of Agriculture.

Mr. William J. Dixon, superintendent, Division of Postmasters, Post Office Department.

Dr. William H. Haas, professor of geology and geography, Northwestern University, representing the Geographic Society of Chicago.

Commander Henry Hartley, officer in charge, Division of Maritime Security, Office of the Hydrographer, Navy Department.

Mr. W. L. G. Joerg, Chief, Division of Maps and Charts, The National Archives.

Lt. Col. Lawrence Martin, Chief, Division of Maps, and Incumbent, Chair of Geography, Library of Congress.

Dr. W. C. Mendenhall, Director, Geological Survey, United States Department of the Interior.

Mr. Raye R. Platt, research associate American Geographical Society of New York.

Mrs. Sophia A. Saucerman, assistant geographer, Department of State.

Dr. John R. Swanton, Bureau of American Ethnology, Smithsonian Institution.

Dr. Frank E. Williams, professor of geography, Wharton School of Finance and Commerce, University of Pennsylvania, representing the Geographical Society of Philadelphia.

EXECUTIVE COMMITTEE

Mr. W. L. G. Joerg, *Chairman*

Mr. E. E. Carter

Lt. Comdr. K. T. Adams

The advisory committee held two meetings during the year, at which matters of general policy and reports of interim action by the executive committee and by the executive secretary were considered. The executive committee held 18 meetings at which 501 names were approved. Decisions on those names are included in a pamphlet entitled "Decisions of the United States Board on Geographical Names rendered between July 1, 1939, and June 30, 1940," which can be obtained from the Board without charge.

The locations of the features on the names of which decisions were rendered, and the sources of the requests for decisions, are as follows:

Geographic Distribution of Names

Virginia.....	198	California.....	8	Minnesota-North	
Montana.....	94	Colorado.....	5	Dakota.....	1
Wisconsin.....	82	Alaska.....	3	Mississippi.....	1
Washington.....	38	Arizona.....	2	New York.....	1
Florida.....	14	Antarctica.....	2	Ohio.....	1
Oregon.....	13	Puerto Rico.....	2	Oklahoma.....	1
Maine.....	11	Delaware.....	2	Tennessee.....	1
Maryland.....	10	Minnesota.....	1		
Texas.....	10			Total.....	501

Sources of Requests for Decisions

U. S. Coast and Geodetic Survey...	237	United States Hydrographic	
National Park Service.....	94	Office.....	2
State organizations.....	89	Bureau of Agricultural Eco-	
United States Forest Service.....	55	nomics.....	2
United States Geological Survey...	19		
War Department.....	3	Total.....	501

WAR MINERALS RELIEF COMMISSION

A. J. Barber, Acting Commissioner

After the World War, Congress recognized a moral obligation to reimburse operators who had been specially stimulated by the request or demand of the Government for net losses incurred in preparations to produce and production of four designated war minerals—tungsten, chrome, manganese, and pyrites. As a consequence, the Congress enacted the so-called War Minerals Relief Act as section 5 of the act of March 2, 1919 (40 Stat. 1272), directing the Secretary of the Interior to administer its provisions. The Secretary of the Interior appointed the War Minerals Relief Commission to organize a staff to examine into the claims filed under the act, and to recommend proper awards for net losses.

Congress amended the act on November 23, 1921 (42 Stat. 322); February 13, 1929 (45 Stat. 1166); May 18, 1936 (49 Stat. 1355); and June 30, 1936 (49 Stat. 2040); each time reopening for review claims that had been filed pursuant to the original act, but without permitting the filing of any new claims.

The work of the War Minerals Relief Commission was suspended during the fiscal year July 1, 1938, to June 30, 1939, for failure of Congress to provide funds for administrative expenses. However, Congress included \$11,200 in the Interior Department Appropriation Act approved May 10, 1939, for the administrative expenses of the Commission for the fiscal year 1939–40, and as a result thereof the work of the Commission was resumed July 1, 1939.

REVIEW OF WORK

At the beginning of the period under review the number of claims under the acts of February 13, 1929, May 18, 1936, and June 30, 1936, totaled 242. Taking into account changes in status and the adjustments and recommendations made by the Commission, 146 claims were disposed of during the fiscal year leaving a total of 96 claims pending adjustment on June 30, 1940.

It is provided in the Interior Department Appropriation Act for the fiscal year ending June 30, 1941, that any claim that has not been

prosecuted and disposed of prior to July 1, 1941, shall not thereafter be considered by the Secretary of the Interior and shall be barred.

I. ACT OF FEBRUARY 13, 1929

Within the period under review the District Court of the United States for the District of Columbia dismissed one case; abated 9 cases; vacated a previous order in one case; and entered 5 decrees.

The Commission adjusted 19 claims under decrees and made recommendations therein to the Secretary of the Interior who made 16 awards totaling \$16,490.59, and denied 3 claims.

There remain under this act seven cases pending in the Court and eight claims under decree from the Court pending in the Commission, for consideration during the fiscal year ending June 30, 1941. One claim, in which a recommendation for denial was made in June 1938, is pending before the Secretary.

II. ACT OF MAY 18, 1936

Within the period under review 40 claims were disposed of by the Commission; 15 by recommendations for awards totaling \$125,068.99; 19 by recommendations for denial of awards; 5 applications for review were withdrawn; and one claim was rejected for improper filing.

The Secretary made 11 awards, totaling \$95,804.07, and denied 17 claims. Recommendations by the Commission for 4 awards totaling \$29,264.92, and for 2 denials are pending approval by the Secretary.

A total of 17 claims are pending review by the Secretary of the Interior, 12 in the Commission and 5 cases in court.

The Act of May 18, 1936, authorized a limited sum of \$1,250,000 for payment of claims thereunder. At the beginning of the fiscal year the balance of the authorized limitation was \$130,342.09. After payment of the awards totaling \$95,804.07, the amount remaining under the authorization was \$34,538.02; allocation of the amounts recommended, but not yet awarded, will, when certified, reduce the authorized limitation to \$5,273.10, as of June 30, 1940.

III. ACT OF JUNE 30, 1936

Within the period of review the Commission considered and made recommendations for awards, totaling \$61,500.06, in 27 claims, and made recommendations for the denial of 25 claims. The Secretary of the Interior made 22 awards totaling \$56,333.57 and denied 23 claims. Recommendations to award \$5,166.49 in 5 claims and to deny 2 claims are pending approval by the Secretary. Claimants withdrew 17 claims and the Commission rejected one claim for improper filing.

Certification of the awards are made to the General Accounting Office. When the claims are allowed, the amounts are then certified by the General Accounting Office to the Treasury Department, and payment of the amounts certified is made when money is made available through deficiency appropriations.

SUMMARY

Total amounts claimed exceed \$687,726.06; the exact figure cannot be determined for the reason that the amount claimed is indefinitely stated in many claims.

Awards made and certified for payment:

Act of February 13, 1929-----	\$16,490.59
Act of May 18, 1936-----	95,804.07
Act of June 30, 1936-----	56,333.57
Total-----	<u>168,628.23</u>

Recommendations for awards, pending:

Act of May 18, 1936-----	29,264.92
Act of June 30, 1936-----	5,166.49
Total-----	<u>34,431.41</u>
Total-----	<u>203,059.64</u>

Number of claims pending in court and before the Secretary of the Interior, June 30, 1940:

Act of February 13, 1929-----	15
Act of May 18, 1936-----	17
Act of June 30, 1936-----	64
Number of claims pending-----	<u>96</u>

NOTE.—This total may be subject to slight changes.

DIVISION OF INFORMATION

Michael W. Straus, *Director*

THE increasing popular interest in Federal conservation activities was reflected in the demands made upon the Division of Information during the past fiscal year. To keep abreast of the significant growth in inquiries, the Division carried forward its program of information about the Department's operations by means of the printed word, the radio, and photography.

Rising public consciousness of natural resource values permitted the Division to approach its objectives of securing popular compliance with the conservation policies laid down by Congress through education in preference to regulation or policing. Education has established itself not only as a more acceptable way for the Department to discharge its conservation responsibilities, when feasible, than placing enforcement agents in the field and litigation, but also has proved less expensive. In its educational program the Division has sought, with considerable success, to use the media of established private publications, radio stations, newspapers and periodicals of wide circulation for dissemination of information instead of performing that task directly at multiplied expense.

Established in 1938 as the medium through which authentic official information concerning the activities of the many bureaus and field agencies of the Department might easily be made available for the public, the Division is comprised of an editorial, radio, photographic, and publications section.

The editorial section issued 844 public announcements during the year, reporting to the public on operations of the 25 separate agencies of the Department. In addition, it prepared or assisted in the preparation of various public reports of the Department and its agencies and handled a vast number of direct inquiries concerning such work.

Preparation of "Current Conservation," a monthly clip sheet for newspapers containing news items in the field of conservation, was continued by the Division during the year. This publication, now in its third year of issue, has met with popular approval as indicated by the fact that in an annual circularization of its subscriber list, not one response requested its discontinuance.

RADIO SECTION

One hundred and thirty-seven thousand five hundred and sixty-three citizens made written request to the Radio Section for information on Conservation as a direct result of radio broadcasts produced by the Section during the fiscal year. One hundred conservation broadcasts were made possible by cooperation of all major networks and stations who contributed radio time valued at more than \$100,000, and in addition defrayed all expenses for actors, musicians, and the like. Research and script preparation were furnished by the Radio Section.

One of the series prepared and written by the Section, "What Price America," was chosen by Whittlesey House for inclusion as among "The Best Broadcasts of 1939-40," with the citation, "Best Government Radio series of the year."

The Section also initiated the cooperation of State and local school authorities in California in an extensive program of research, planning and writing of radio programs on conservation and reclamation activities in connection with the great Central Valley Project.

A total of 18 agencies of the Federal Government outside the Department of the Interior made increasing use of the studios, personnel, and mechanical equipment administered by the Radio Section. In addition, extensive help was given to educators, schools, colleges and school systems in filling requests for conservation material for use on the air.

PHOTOGRAPHIC SECTION

The Photographic Section effectively illustrated the many and varied activities of the Department by furnishing photographic service which received wide publication.

Important photographic work of the year was coverage of the Indian reservations, proposed national parks and monuments, the bituminous coal industry, and progress work on irrigation dams. An outstanding feature was the demand for pictorial material from rotogravure sections of various newspapers and news services, with wide-spread reproduction throughout the press of the country.

Colored lantern slides and transparencies relating to national parks and reclamation projects were distributed for the use of the general public to interested groups and organizations.

Through its Motion Picture Distribution Office, the Photographic Section continued the general circulation of motion picture films illustrating the diversified functions of the various bureaus of the Department of the Interior. Additions to the motion picture library included

the films of the Bureau of Biological Survey and the Bureau of Fisheries, transferred from the Departments of Agriculture and Commerce, respectively, in the latter part of 1939.

All of these films were loaned upon request to educational institutions, civic and public organizations, and other interested groups in practically every State in the Union as well as in a number of South American countries. They have proved to be an effective means of informing the general public how it may best assist the Department of the Interior in carrying out the conservation policies laid down by Congress.

PUBLICATIONS SECTION

The Publications Section continued to serve as the liaison agency between the Government Printing Office and the Department. It prepared all requisitions for printing, maintained records and accounting systems for printing work, and served as the distributing point for publications in the Department.

OFFICE OF EXHIBITS

Harold W. Graves, *Acting Supervisor*

SINCE 1934, the Office of Exhibits has served to present to the public a visual conception of Department of the Interior activities in the preservation of natural resources and its contribution to the economic and social welfare of the American people. As a result of its operations, exhibits consisting of animated dioramas and models, relief and animated maps, murals, transparencies and charts have been installed and viewed by thousands of people daily at national and international world's fairs, state and county fairs, expositions and conventions.

Today, the Office is in a position, both from the standpoint of equipment and skill, to render valuable aid in national defense through the preparation of maps, construction of models required by the Army or Navy, and the preparation of exhibits and displays as well as painted posters for reproduction.

With the popularity of the displays evidenced by a substantial increase in the number of requests for permission to use the exhibits, the Office has on hand approximately \$75,000 worth of material which is loaned, free of charge, to groups, organizations, schools or colleges.

THE YEAR'S ACCOMPLISHMENTS

Maintaining a studio and workshop with a staff of skilled craftsmen, the Office of Exhibits, during the fiscal year 1940, designed and built approximately \$30,000 worth of new exhibit material. Included in this work was an animated diorama of Bonneville Dam and power house on the Columbia River in Washington State. An animated and illuminated map, showing the natural resources found in the four Northwestern States, as well as the opportunities for electric light and power afforded by the Bonneville project, also was prepared. In addition, two large cases containing colored transparencies illustrating the advantages of increased use of Bonneville power were furnished.

During the same year, the Office of Exhibits completed one of its largest animated dioramas for the Government of Puerto Rico at a cost of nearly \$5,000. This diorama is an exact replica in every detail of the city of San Juan and the new airport and harbor, and was installed in the Puerto Rico Building at the New York World's Fair.

The Office of Exhibits also constructed another large diorama showing the entire city of Washington. This was built for the National Capital Parks Planning Commission at a cost of \$4,800, to assist it in the planning, designing, and locating of new Federal buildings in the District of Columbia.

Two groups of four dioramas each were built for the Coronado Exposition Commission. One of these groups, to be installed as part of the permanent exhibit in the Museum at Canyon, Tex., depicts early pioneer life on the plains of West Texas, and includes representations of early ranch life, transportation, wolf hunts and Indian buffalo hunts on the plains.

The second series of dioramas for the Coronado Exposition, to be placed on display at Phoenix, Ariz., includes a reproduction of Old Fort Elliott in northern Texas; picturization of a band of soldier scouts searching for marauding Indians; an attack of a wagon train of early pioneers by Indians; and a replica of the first prairie home to be set up on the western plains.

The Office also designed and constructed an exhibit of the Bureau of Mines at the Eighth Scientific Congress held in Washington during the past year.

The use of dioramas and exhibits by the various bureaus and offices of the Department of the Interior has proven so valuable in the past, that already approximately \$27,500 worth of new material of this nature has been scheduled for the present fiscal year.

INTERIOR DEPARTMENT MUSEUM

H. L. Raul, *Museum Curator*

ESTABLISHED March 8, 1938, the Museum of the Department of the Interior has pioneered as a comprehensive governmental department museum. Designed as an historical, scientific, and educational institution, this modern museum is unique in its particular field. Popularly called an "Exposition of Conservation," the Museum visualizes and explains the history, organization, and present activities of the various bureaus of the Department.

Due to recent accessions and reclassification of the exhibits, the Museum at present contains approximately 1,300 specimens, 111 historical charts and maps, 12 large illustrated hand-painted mural maps, 75 scientific scale models, 190 interpretive oil and water-color paintings and sculptures, 9 large mural paintings, 11 historical and scientific dioramas, 389 special photographs, 12 large mural silhouettes, 11 illuminated transparencies, and numerous miscellaneous exhibits; there are approximately 1,600 explanatory labels, making a total of more than 3,700 items.

A plan for "Conducted Museum Tours" was formally inaugurated by the Secretary during the past year. These tours were popular and proved the effectiveness of trained guidance, as compared with casual museum circulation, the modern museum technique of dynamic visual education serving to inform the public of the vital responsibilities vested in the Department concerning natural resources in relation to the national defense. Conducted tours were arranged for congressional parties, educational and tourist groups. Due to frequent requests from the public for guided Museum tours ample staff assistance should be provided to make it possible to extend and enlarge this service.

During the past year, 5 original special exhibits were prepared and displayed by the Museum in collaboration with the Bureaus, covering the following subjects:

Grazing Service; Present Status of Indian Reorganization; the Work of William H. Jackson, Pioneer Government Photographer; a special exhibit for the Eighth Scientific Congress; and Geology of the Alaska Railroad Region.

These special exhibits were favorably received and have been requested by the United States Travel Bureau for further display in New York City.

An important new accession, the Colburn Collection of Indian Basketry, was the gift of Mrs. Frederick H. Colburn of San Francisco. This collection contains approximately 300 specimens of characteristic shapes, decorative designs, materials and stitches, used by various groups of Indians ranging from Alaska to the Mexican border, and including antiques of the Southwest. Many rare and valuable specimens are included in this collection.

Among the Museum betterments accomplished during the year may be listed the following: A progressive Museum program with new features introduced; new displays and case revisions; a flexible filing system devised and installed; new methods of Museum extension service established; approved methods established for care and handling of exhibits; tourist information activity in "Travel America Year" program established; assistance rendered in preparing conservation study courses for school and college classes, and establishment of an information desk reference library relating to current Departmental activities and technical reports.

The consolidation under the President's Reorganization Plan, of the Bureau of Fisheries, the Biological Survey, and the Wildlife Division of the National Park Service, now designated the Fish and Wildlife Service of the Department of the Interior, brought a highly desirable exhibit feature into the Museum. Plans comprising animated dioramas and case displays are in progress for representation of the new Service among the exhibits.

The visitor's register of the Museum contains names from every State in the Union and from the outlying Territories and island possessions. More than 40 States have been represented in a single month, and an average of 4,000 to 5,000 persons visited the Museum monthly. Systematic efforts were made to contact visiting convention delegates, schools and colleges, churches, civic organizations, and other local and national groups.

ST. ELIZABETHS HOSPITAL

Winfred Overholser, M. D., *Superintendent*

I HAVE the honor to submit herewith the annual report of St. Elizabeths Hospital for the fiscal year ending June 30, 1940.

Under the terms of Reorganization Plan IV, made effective June 30, 1940, St. Elizabeths Hospital was transferred from the Department of the Interior to the Federal Security Agency. This is, therefore, the last report of this Hospital which will be submitted to the Secretary of the Interior.

It is gratifying to record that the general state of the health of the patients was held at a high level during the past fiscal year, and that no epidemics or other catastrophes occurred. The physical plant was developed and maintained in an excellent state of repair; several administrative changes designed to improve the care of the patients were carried out; and the teaching and research programs were prosecuted vigorously.

MOVEMENT OF POPULATION

On June 30, 1940, 6,535 patients remained in the hospital as compared with 6,274 on June 30, 1939, an increase of 261.

The total number of patients under treatment during the year was 7,476, as compared with 7,024 the preceding year, an increase of 452.

The total number of admissions during the year was 1,202, as compared with 1,056 the preceding year, an increase of 146. With the exception of the year 1919, following the World War when 1,802 patients were admitted, this is the largest number of admissions recorded in the history of the hospital; 86 of the patients admitted were former patients of St. Elizabeths Hospital, and 116 others were former patients of other mental hospitals.

The total number of discharges was 619, as compared with 469 in the preceding year, an increase of 150.

The total number of deaths for the year was 322, as compared with 281 for the preceding year, an increase of 41.

The total number of discharges and deaths, combined, was 941, compared with 750 the previous year, or an increase of 191.

There were 59 burials in the hospital cemetery, as compared with 66 the preceding year, a decrease of 7. All honorably discharged service men are entitled to burial in the Arlington National Cemetery. All bodies not buried at the hospital or in the Arlington National Cemetery were taken by registered undertakers for burial in other cemeteries.

The daily average patient population was 6,395, as compared with 6,108 the preceding year, an increase of 287; 905 District patients were admitted as against 777 for the previous year, an increase of 128.

Movement of Patient Population, Fiscal Year 1940

	Male			Female			Total
	White	Colored	Total	White	Colored	Total	
Remaining on rolls June 30, 1939.....	3,043	1,022	4,065	1,389	820	2,209	6,274
Admitted during year ended June 30, 1940.....	565	195	760	283	159	442	1,202
Total number under care and treatment during year ended June 30, 1940.....	3,608	1,217	4,825	1,672	979	2,651	7,476
Discharged as—							
Not Insane.....	10	4	14	3	0	3	17
Recovered.....	120	33	153	85	32	117	270
Improved.....	93	23	116	28	20	48	164
Unimproved.....	92	24	116	41	11	52	168
Total discharged.....	315	84	399	157	63	220	619
Died.....	120	76	196	83	43	126	322
Total of patients discharged and died.....	435	160	595	240	106	346	941
Number of patients remaining on rolls June 30, 1940.....	3,173	1,057	4,230	1,432	873	2,305	6,535

At the close of the year 324 patients were carried on the rolls on visit as compared with 336 on June 30, 1939, a decrease of 12 patients.

In the annual report for 1939 comment was offered to the effect that an increase of 73 colored admissions had been noted, whereas white admissions had fallen off by 46 in the preceding year. No such phenomenon is observed this year. The increase of admissions, white and colored, over 1939 was 146; a net decrease of 2 was noted in the colored, whereas 148 more white patients were admitted in 1940 than in 1939.

MEDICAL DEPARTMENT

The condition of the 225 patients who received shock therapy during 1937-39 was checked and showed the following results July 1, 1940, as compared with the results of July 1, 1939:

RESULTS OF SHOCK THERAPY IN DEMENTIA PRAECOX (202 PATIENTS)

	In hos- pital	On visit	Dis- charged	Dead
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
July 1, 1939.....	78.7	7.9	11.9	1.5
July 1, 1940.....	69.8	2.5	26.2	1.5

RESULTS OF SHOCK THERAPY IN PSYCHOSES OTHER THAN DEMENTIA PRAECOX
(23 PATIENTS)

July 1, 1939.....	52.2	39.1	8.7	0
July 1, 1940.....	47.8	17.4	34.8	0

TOTAL RESULTS (225 PATIENTS)

July 1, 1939.....	76.0	11.1	11.6	1.3
July 1, 1940.....	67.6	4.0	27.1	1.3

In the cases of dementia praecox the number of patients in the hospital was reduced by 8.9 percent. The number of patients on visit decreased by 5.4 percent and the discharged patients increased by 15 percent. The increase in discharges occurred chiefly in that group of patients who received both insulin and metrazol therapy.

In the group of patients suffering from psychoses other than dementia praecox who received shock therapy, the number of patients in the hospital was reduced by 4.4 percent. The number of patients on visit decreased by 21.7 percent and the patients discharged increased by 26.1 percent.

Of the total 225 patients who received shock therapy during 1937-39, 67.6 percent are still in the hospital.

Only two patients were given shock therapy during 1939-40. One patient is a manic-depressive depression and the other is a case of dementia praecox of the catatonic type. Both of these patients received metrazol and have shown some improvement, but are still in the hospital.

The Nurses Examining Board of the District of Columbia made an inspection of the Hospital Training School, and notified the hospital under date of April 30, 1940, that that part of the School in operation was fully accredited.

During the past year centralized nursing was established under the direction of the Director of Nursing Service. A higher general standard of nursing care of the patient resulted.

The students enrolled in the class of the Training School numbered 27 in the second year and 16 in the first year under date of June 30, 1940; there were 27 affiliate students, 12 postgraduates, and 11 affiliates

from Freedmen's Hospital, a total of 93. The 28 students in the 1941 class went on affiliation March 15, 1940 to the School of Nursing, Jersey City Medical School. One resigned to be married, leaving 27 on affiliation.

During the year 205,351 hydrotherapeutic treatments were given.

The amphitheater in B Building was remodeled and converted into a ward, with accommodations for 32 patients. The patients transferred to this ward are all untidy, semidisturbed patients, and intensive therapy along the lines of habit training and an activity program is being undertaken.

Continuous Treatment Building No. 4 was opened for use on September 15, 1939, providing beds for 186 patients. With the completion of this building the quadrangles between the buildings were enclosed with a wire fence, permitting the patients to obtain an abundance of fresh air and exercise. Through the courtesy of the Red Cross they have been provided with indoor baseballs and footballs which add materially to the enjoyment of their recreation.

A barber shop in the basement of Center Building was completed in October 1939.

The activities of the services of the Medical and Surgical Department again increased over that of any previous year. This was due to increase in ward admissions and to the number of patients admitted to the clinics.

On the first of January 1940 a new system of daily reports was inaugurated in the service, designed to give certain statistical information demanded periodically of the hospital by various national medical organizations. Such information concerns the number of patient days, average days stay, daily average of patients, etc., for each diagnostic classification, as well as for total census. The 6 months from January to June 30, 1940, under this system, showed 1,107 patients admitted with an average days stay of 26.1, and daily average number of patients in the Medical and Surgical Building of 177.7.

The principal work of interest in the medical service during the past year was in connection with a pneumonia epidemic during the winter months. The principal therapy used, supported by the usual measures, was the new drug sulfapyridine. In a few cases selected for special reasons this was combined with antipneumococcus serum. The epidemic presented both the lobar and bronchial types of pneumonia, the latter being slightly more preponderant, and the result of the therapy in both types was extremely satisfactory. In addition to a definite lowering of mortality the principal effect was to shorten the course of the disease materially.

During the year 21,633 patients visited the various clinics in the Medical and Surgical Service, and the number of clinic visits was 43,317.

Members of both the clinical and laboratory staff have taken part in research work. The following studies have been carried out; some of them completed and formulated in papers:

1. Dr. R. H. Guthrie: A clinical and anatomopathological study of cases with cerebral arteriosclerosis (completed).
2. Dr. J. Showalter: Pituitary tumors; the role of tuberculosis and lues in etiology (completed).
3. Dr. Laura Ehrlich: Brain tumor, a clinical and pathological study.
4. Dr. Frank Tartaglino: Mental disorders following administration of sulfanilamide.
5. Drs. Cruvant, Silverberg, and Katzenelbogen: The distribution of sulfanilamide between blood and cerebrospinal fluid.
6. Drs. Louis Cohen, Morrow, and Katzenelbogen: Study of patients with post-encephalitic sequelae, with special reference to mental disorders.
7. Drs. Simon and Morrow: Treatment of post-encephalitic disorders with Rabellon.
8. Dr. Perlson: Delirium, mainly comprehensive review of the literature.
9. Dr. Weickhardt: Manic-depressive psychosis, mainly comprehensive review of the literature.
10. Dr. Fong: Therapeutic quartan malaria in the therapy of neurosyphilis among Negroes.
11. Drs. Ratcliffe and Katzenelbogen: The urinary elimination of phenolphthalein injected into the cerebrospinal canal.
12. Drs. Cohn, Langenstrass, and Katzenelbogen, and Miss Neumann: Pharmacological shock therapy, insulin and metrazol studies in cats (completed).
13. Drs. Cohn and Katzenelbogen: Electroencephalographic studies in mute schizophrenic patients who received sodium amylal intravenously.
14. Dr. Cohn: Electroencephalographic studies in parietic patients.
15. Drs. Cohn and Katzenelbogen: Electroencephalographic studies in schizophrenic patients with emphasis on relationship between changes in clinical condition and those in the brain waves.
16. Dr. Cohn: Electroencephalographic studies in morphium addicts.
17. Dr. Cohn: Electroencephalographic studies in normals.
18. Dr. Katzenelbogen and Laboratory Staff: Biochemical studies in schizophrenic patients. Determination of lipids and minerals in both arterial and venous blood. In this work we are helped by Dr. Haws, who obtains the specimens of blood from the internal jugular vein and femoral artery. Our research activities in which the Division of Biochemistry, and electroencephalography and histopathology took part were greatly facilitated by the fund donated by the Supreme Council, 33° Scottish Rite Masons, of the Northern Jurisdiction, U. S. A. This fund permitted us to acquire equipment and chemicals and to pay salaries to a full-time biochemist and a part-time technician in histopathology.

Libraries.—The Medical Library received the addition of 105 books purchased, 27 of which went for the nurses' collection. Twenty-eight books transferred from the Training School, and 1,624 books given by the widow of the former superintendent, Dr. William A. White. This last collection will be set apart as the Dr. William A. White Library. During the year the library received periodicals as follows: By hospital subscription, 49 American, 9 English, 6 German, and 2 French, free articles received 19, a total of 85. Due to the present war in Europe there has been some irregularity in the reception of foreign periodicals.

During the year 804 volumes were added to the Patients' Library. The total number of books on hand is 18,337, and 36 popular magazines and 5 newspapers, daily and Sunday, were regularly received. Over 300 books are drawn daily and approximately 3,800 books are in constant circulation, two-thirds of which are fiction.

Social service.—The total number of patients supervised by the Social Service during the year was 415.

Out-patient service.—A psychiatric follow-up clinic should be organized for patients who have been released from St. Elizabeths Hospital. Plans are now under way to establish such an out-patient department on an informal basis. It is hoped that statutory authority for such an activity may be secured. This lack of an out-patient department is probably the only respect in which the Hospital fails to meet the ideal requirements set by the American Psychiatric Association. A psychiatric out-patient department for the purpose of following patients who have been released from the hospital would not only render a service to the hospital patients but perhaps result in a saving to the District, and possibly a more liberal policy with regard to the release of patients and would be feasible if provision should be made for their nominal psychiatric supervision in the community.

Red Cross.—The local representatives of the American Red Cross under the Field Director continued their program of former years.

The Red Cross House is kept open daily from 10 a. m. to 8 p. m. throughout the year, and approximately 750 patients come to the House each day.

The Red Cross furnished moving-picture operators for 84 movies, and initiated and directed 280 parties and entertainments. They had 305 different activities on the wards; arranged 16 band concerts; distributed 3,200 tickets to theater and baseball parties; and transported the patients, through the kindness of the Motor Corps of the District of Columbia Chapter, to and from these activities. They arranged transportation for 150 ex-service patients who attended the White House Garden Party, and for 250 men and women patients who were guests on a cruise down the Potomac River. There were 18 baseball games played by the patients' team on the hospital diamond, attended by an average of 400 patients, and an average of 600 patients attended the baseball games played by the hospital employees.

During this fiscal year the Red Cross has had the services of a number of W. P. A. workers. The W. P. A. musical program has been extensive during the past year. The W. P. A. Orchestra played for both colored and white dances during the past year.

The assistance of the Red Cross is invaluable, and the intelligent and cordial cooperation of their personnel has added much to the

smooth running of the hospital and to the welfare and happiness of the patients.

ADMINISTRATIVE DEPARTMENT—OFFICE OF THE ASSISTANT TO THE SUPERINTENDENT

Supplies.—The supplies produced on the hospital reservation, farm, garden, and other products, included 293,357 gallons of milk, 146,519 pounds of fresh pork, 5,353 pounds of chickens, 14,719 dozens of eggs, 724 bunches of asparagus, 90 bushels of apples, 436 bushels of beans, 19,000 bunches of beets, and 485 bushels of cabbage.

In addition to the items mentioned, 26,369 gallons of ice cream were manufactured by the hospital.

The shoe shop produced 8,094 pairs of shoes and slippers for men, and 2,356 pairs of shoes and slippers for women and children. It repaired 2,100 pairs of shoes and slippers. It produced 3,116 men's belts, and 1,164 pairs of suspenders.

The mattress shop produced 2,747 mattresses and 2,413 pillows. The brush shop turned out 2,876 of various kinds of brushes. The broom shop made 6,175 common brooms and 100 whisk brooms. In the bakery there were baked 924,903 loaves of bread, 3,581,136 rolls, and 73,912 pounds of pastry. The laundry washed, dried, and ironed 14,188,433 pieces. The power plant manufactured 551,236,000 pounds of steam; the electrical department generated 3,848,640 kilowatt-hours of electricity; 463,521,000 gallons of water were pumped, and the main refrigeration plant produced 7,430 tons of ice and refrigeration. All the steam, electricity, ice, and refrigeration used on the reservation was manufactured by the hospital.

In addition, large quantities of clothing for men and women were made in the sewing rooms, tailor shops, and occupational therapy departments, and other items in various shops of the hospital.

Dairy and cow barn.—The Holstein-Friesian herd was again tested for tuberculosis and found to be free of the same, and after a further test to be free from Bang's Disease. This has been considered an accredited herd for over 30 years.

Hemorrhagic septicemia destroyed five cows in November and December. Vaccination checked it promptly. Calf pneumonia caused the greatest loss during December and January; 20 calves died of this disease in spite of treatment. The calf herd has been vaccinated with hemorrhagic septicemia bacterin with fairly good results; such vaccinations are being continued.

The milk supply fell below normal production during the months of September, October, and November, 1939, but during the months of December, January, and February the milk production rose to the

highest point in the history of the herd; a total of 29,531 gallons of milk were produced in March, with an average daily production of 952½ gallons. The average production for the fiscal years 1935 to 1939 was 281,140 gallons, and in 1940, 293,542 gallons were produced, an increase of 12,402 gallons over the past five-year average.

At the end of the fiscal year the hospital herd consisted of 94 calves, 78 heifers, 268 cows, and 11 bulls.

Piggery.—Conditions at the piggery have steadily improved. The herd at present consists of 1,048 animals. During the year 575 hogs were slaughtered, furnishing 146,519 pounds of fresh pork.

Poultry plant.—The poultry plant is gradually getting back to normal production of both meat and eggs. In 1938 the entire flock was killed off on account of the prevalence of parasites and disease among the fowls. The grounds and buildings were disinfected during the summer, and a new flock was started in the fall of 1938. These pullets began laying in February 1939 and since that time the production of meat and eggs has gradually increased.

During the year the greenhouse furnished 17,997 roses, 12,459 carnations, 4,696 calendula, 11,725 stevia, 462 chrysanthemum, 1,397 pompom chrysanthemum, 2,897 daffodils, 1,337 freesia, 1,107 hyacinths, 1,435 tulips, and 1,185 baskets of flowers. In addition, 2,276 bunches of assorted flowers were provided from the flower gardens.

Personnel.—The total number of employees on the hospital rolls June 30, 1940, was 1,867. There were 485 appointments during the year, and 404 separations.

During the year 20 employees were retired from the service on account of age and disability.

There was a 15 percent turnover in the permanent personnel, occurring chiefly in the force of attendants. This was an increase of 1½ percent over the previous year.

The problem of recruiting personnel for filling vacancies is becoming increasingly difficult, primarily due to the delays in securing eligibles from the Civil Service Commission.

There was an increase of 1,182 days of sick leave taken during the calendar year 1939 over the previous year. A total of 9,800 days of sick leave was taken by 986 employees. The average number of days for all employees increased ½ day per employee.

The Episcopal Chaplain, Rev. Roy E. LeMoine, resigned May 1, 1940, effective June 30.

Purchases.—Supplies were ordered in the amount of \$1,400,025. Of this amount, \$1,065,485 were open market purchases. There were 335 formal contracts entered into, amounting to \$334,539.

Financial office.—During the year disbursements approved through the financial office amounted to \$4,698,777. Collections received and deposited totaled \$3,242,498.

Fire department.—Regular inspections were made of the hospital by the fire marshal. The fire siren is tested monthly, and also the fire alarm system. The fire pumps at the powerhouse were tested weekly, and the triple combination pumper was tested daily and put in service once a week. Inspections are made weekly with officers and privates of the District of Columbia Fire Department, and occasionally with inspectors from the fire marshal's office. Fire drills are held weekly in various wards of the institution.

During the year there were 31 fire alarms, the property damage amounting to \$360. Approximate loss from fires from June 19, 1917, to June 30, 1940, \$6,234.05. The number of calls in this period was 305. The average loss was \$271.05 a year, and average number of calls 13.3 a year.

Continuous Treatment Building No. 4.—This building was completed, and a hydrotherapeutic department and a barber shop have been installed.

Continuous treatment buildings Nos. 5 and 6.—The work on continuous treatment buildings Nos. 5 and 6 is well under way and should be completed so as to be occupied about October 1, 1940. This will add facilities for approximately 400 beds.

The buildings were approximately 76 percent completed on June 30, 1940. On account of strikes several delays have occurred, for which an extension of about 126 days was approved.

Construction department.—Two rooms in the basement of the old Center Building were remodeled and converted into a barber shop for the use of the West Side Service. A new tile floor was laid and walls and ceiling replastered; a toilet room was installed, and guards placed in the windows.

Additional guards were placed on the sun porch of the Men's Receiving Building, being located on the fifth floor of that structure, to make it safer in preventing the patients from getting out of this porch.

B Building, Ward 4, was completely renovated. The plaster was almost entirely renewed, the floors and woodwork repaired, and the ward repainted.

The old operating room in B Building was made over into a ward with provision for 32 patients, and is known as Ward B-5, for women patients.

Electrical department.—The work of the electrical department has continued to grow. Not only is it required to provide hospital radio service for the patients in the various buildings, but many of the

patients have their own private sets installed under the supervision of the hospital.

Automatic telephone.—Five additional automatic telephones have been installed. The hospital automatic telephone system traffic amounted to 1,520,691 calls, the daily average being 4,152, and the hourly average 173. This represents an increase over the previous year of 3 percent.

During the year a new high-pressure steam line to the new hot water heater in the basement was installed at the laundry. An additional heater has been ordered in order to meet the increased demands of this department.

A new tractor, gas engine operated with scoop attached, was put in service at the power plant to move coal from the coal pockets to the coal conveyor and silos. This relieves the necessity of employing additional help for this purpose.

Guard force.—The guard force made several investigations of reports of stealing and were instrumental, with the assistance of the Metropolitan Police Force, in recovering stolen property consisting of 38 pigs, 4 hogs, and 13 bags of mill feed.

Laundry.—The work of the laundry continues to the same extent as previously reported. The number of pieces laundered, dried, and ironed during the year was 14,188,433.

Not only is the present laundry overcrowded but the limited methods of ventilating involve a hardship on the patients and employees who must work in this building. During the summer weather the temperature ranges from 116° to 120°. The serious overcrowding of equipment and the unpleasant working conditions call for immediate relief. The erection of a storeroom and warehouse building, the lower floor of which can be used for a laundry, is recommended.

Garage.—The work of the garage continued to increase. Not only is it necessary to use trucks for delivering material, but the additional buildings further removed from kitchens require food to be taken from the kitchens to the dining rooms. The growth of the population extending over the 400 acres of land required it to furnish transportation for 38,792 patients by bus and ambulance. Invalid coach stretcher cases were 587. This department must be in service 24 hours a day and 365 days a year.

Culinary department.—The dietetic force, like other departments, has been under pressure due to the increased number of patients.

Classes in dietetics for 20 student nurses were given, one lecture and 4 hours laboratory weekly. This instruction was given by one of the dietitians from February 6, 1940, for 15 consecutive weeks, 3 hours a week. A new class started June 4, 1940, and continued to the

end of the year; this class is for 16 student nurses, and consists of 15 hours of lecture, 2 a week of 1 hour each.

General, sick, and TB menus are made for 10-day periods, and a copy of these sent to each kitchen.

Visits are made regularly by the dietitians to the dining rooms in the respective services, supervising methods of serving the meals.

Creamery.—During the year the dairy pasturized 289,735 gallons of milk, a daily average of 793 gallons. About 1,000 quarts of milk were bottled daily; the remainder was canned for use in the kitchens and bakery and for making ice cream. A total of 61,000 gallons of pasteurized milk was purchased. The average consumption of milk during the year was 958 gallons per day. During the month of June, 1,510 gallons of skimmed milk was received from the Department of Agriculture farm at Beltsville, Md. This milk was used by the various kitchens for cooking purposes.

An average of 25 gallons of buttermilk was made daily by the cultured starter method.

The ice cream department manufactured a total of 27,043 gallons of ice cream, a daily average of 74 gallons.

NEW LEGISLATION

The President approved an act, under date of August 9, 1939, containing amendments in the laws setting up a Commission on Mental Health as an arm of the court to hear evidence and make recommendations to the court regarding the commitment of persons alleged to be suffering from mental disorder. These amendments have a tendency to improve the original act. There are several other amendments that should be made, such as provision for voluntary admission and family care.

Upon the recommendation of the Department of the Interior, legislation was introduced in Congress permitting the admission to St. Elizabeths Hospital of certain persons who are permanent residents of the Virgin Islands of the United States, who are citizens or nationals of the United States, and who have been legally adjudged to be insane in the Virgin Islands. This legislation has received favorable reports from the committees to which it was referred. If enacted, it will remedy an unfortunate situation with reference to the mentally ill of the Virgin Islands.

Similar legislation should be enacted looking toward the care and treatment of the white mentally ill in the Philippine Islands, since no provision has been made for citizens of the United States who may require mental treatment in those islands, and whose State residence cannot be determined.

NEEDS OF THE HOSPITAL

The hospital continues to grow. The admissions are increasing, and there is still a shortage of beds. One thousand beds should be provided to cover immediate needs and to include the replacement of the semipermanent group of buildings which were erected in 1918, with an estimated life of from 15 to 20 years. This semipermanent group of 530 beds is in a dilapidated condition and far from fire-proof. The cost of repair is increasing, and the hazard from fire is considerable.

The increase of 306 in the population during 1939 and 261 in 1940 more than offsets additional beds previously authorized. At the present time the hospital has practically no available beds and it has been necessary to put additional beds on various wards to take care of the new patients as received.

Two continuous-treatment buildings are to be located adjacent to the continuous-treatment kitchen where provision has been made for the preparation and service of food; dining rooms will have to be provided and a tunnel connection to the kitchen so that the food may be brought to the building. It is planned to have cafeteria service in the dining rooms attached to these buildings. The same condition applies to the three buildings that are suggested to replace the semipermanent group. Ground room is available for these buildings.

The present storeroom was built more than 30 years ago. Since that time the population has very nearly tripled, but no change has been made in the storeroom and warehouse. The present storeroom, with cold-storage equipment, is practically out of date and the storage facilities are insufficient to care for adequate quantities of current supplies. In order properly to house supplies that must be cared for and regularly issued to the various buildings and industries, all sorts of out-of-the-way places have been utilized. The basements of many buildings housing patients have been used for storing furniture. The District Fire Department properly objects to this procedure. It is difficult to give proper protection to articles in all classes of buildings, and there is possibility of shrinkage.

An estimate of \$950,000 is recommended to purchase farm land, to construct buildings to house patients who would work on the farm, to construct buildings to house employees, for the farm animals, including dairy, piggery, poultry plant, a building for pasteurizing milk, making ice cream, and other necessary farm buildings, including expenditures for the purchase of land, preparation of plans and specifications, advertising, and supervision of construction.

The hospital consists of four plots of land, in all about 800 acres. The last land purchased for hospital use was in 1891. At that time

the hospital had about 1,500 patients, and over 600 acres were used for farm and garden purposes. The hospital, while originally isolated some miles from the center of the city, at the present time on account of the growth of the city and the use of various forms of transportation, is now adjacent to the city and is surrounded by a growing population. The dairy and piggery are in proximity to buildings occupied by patients, and the dairy barn is adjacent to Nichols Avenue, a thoroughfare running through this section of the city, both the dairy and piggery being the subject of a good deal of justified complaint on the part of the inhabitants of this section.

It is believed desirable to obtain approximately 5,000 acres of land, to concentrate all farm projects in one place, increase the size of the dairy herd, the piggery, and the poultry farm, and build about 6 cottages, housing 40 patients each, on this site. This arrangement would permit an increased number of patients to derive the therapeutic benefits of healthful outdoor occupation. This would also prove an economic arrangement, in that the hospital would be able to secure sufficient milk for all purposes, to increase the quantity of pork products, and probably to cure pork products, thus reducing the quantity of ham, bacon, and shoulder to be purchased, and also increase the quantity of poultry products, such as fowl and eggs. Furthermore, the removal of the farming activities from the Nichols Avenue site would make available a considerable area of valuable land which could be used for further buildings and for other activities closely related to the immediate problem of the care of patients. Preliminary studies indicate that such a site could be secured within from 10 to 20 miles from the main plant.

PUBLICATIONS

Overholser, Winfred, Superintendent:

Psychiatric Expert Testimony. *Mental Health*. Publication No. 9 of the American Association for the Advancement of Science. Lancaster, Pa., the Science Press, 1939, p. 313-318.

Psychiatry and the Law—Cooperators or Antagonists? *Psychiatric Quarterly* 13: 622-638, October 1939.

The Broadening Horizons of Medicine. *Science* 90: 359-363, October 20, 1939.

Famous Madcaps of History. Abstract of Lecture sponsored by Chicago Medical Society, Chicago, Ill., November 1, 1939. *Chicago Medical Society Bulletin*, 42: 314-318, November 25, 1939.

Some Possible Contributions of Psychiatry to a More Effective Administration of the Criminal Law. (Presented by invitation before the Montreal Psychiatric Society, April 27, 1939.) *The Canadian Bar Review*, 17: 638-655, November 1939.

The Desiderata of Central Administrative Control of State Mental Hospitals. (Read at the ninety-fifth annual meeting of the American Psychiatric Association, Chicago, Ill., May 8-12, 1939.) *American Journal of Psychiatry* 96: 517-534, November 1939.

Reformation of Criminals. (Book review: Problems in Prison Psychiatry, by J. G. Wilson and M. J. Pescor.) Scientific Monthly 50: 80-81, January 1940.

Problems in Prison Psychiatry, by J. G. Wilson and M. J. Pescor. (Book review.) Mental Hygiene 24: 141-143, January 1940.

Famous Madcaps of History. Illinois Medical Journal 77: 253-262, March 1940.

Some Pioneer Psychologists. (Book review: Mind Explorers, by John K. Winkler and Walter Bromberg.) Scientific Monthly 50: 272, March 1940.

The Life of the Mind. (Book review: Facts and Theories of Psychoanalysis, by Ives Hendrick.) Scientific Monthly 50: 370-371, April 1940.

Crime and Society, by Edward A. Strecker. (Book review.) Mental Hygiene 24: 304-305, April 1940.

Beyond the Clinical Frontiers, by Edward A. Strecker. (Book review.) Journal of the American Medical Association 114: 2052, May 18, 1940.

Intelligence and Crime, by Simon H. Tulchin. (Book review.) American Journal of Psychiatry 96: 1476-1477, May 1940.

Are Mental Disorders Increasing? (Book review: New Facts on Mental Disorders, by Neil A. Dayton.) Scientific Monthly 50: 559-561, June 1940.

Saint Elizabeths Hospital: Past, Present and Future. In Papers Presented Before Third Annual Meeting of the Medical Society of St. Elizabeths Hospital, April 20, 1940. Washington, D. C., United States Department of the Interior, 1940.

Eldridge, Watson W., Principal Medical Officer:

The Incidence of Hyperostosis Frontalis Interna in Female Patients Admitted to a Mental Hospital. (With G. A. Holm.) American Journal of Roentgenology and Radium Therapy 43: 356-359, March 1940.

Katzenelbogen, Solomon, Director of Laboratories:

Electro-encephalographic Studies. (With Robert Cohn.) United States Naval Medical Bulletin 37: 596-599, October 1939.

A Critical Appraisal of the "shock therapies" in the major psychoses, I: Insulin. Psychiatry 2: 493-505, November 1939.

An Attempt to Condition Gastric Secretion to Histamin. American Journal of Physiology 128: 10-12, December 1939.

Functional Diseases of the Gastro-intestinal Tract: a Viewpoint of the Psychiatrist. Diseases of the Nervous system 1: 1-4, January 1940.

Pharmacologic Shock Therapy. New International Clinics 1: 105-114, March 1940.

A Critical Appraisal of the "shock therapies" in the Major Psychoses, II: Insulin. Psychiatry 3: 211-228, May 1940.

Karpman, Benjamin, Senior Medical Officer:

The Delinquent as a Type and Personality. Journal of Criminal Psychopathology 1: 24-33, July 1939.

The Mental Roots of Crime: a Critique. (Critical Review of The Roots of Crime by Alexander and Healy.) Journal of Nervous and Mental Disease 90: 89-142, July 1939.

Thalassa: a Theory of Genitality, by Sandor Ferenczi. (Book review.) American Journal of Psychiatry 96: 747-755, November 1939.

Principles and Aims of Criminal Psychopathology. Journal of Criminal Psychopathology 1: 187-218, January 1940.

- Holm, George A., Internist: The Incidence of Hyperostosis Frontalis Interna in Female Patients Admitted to a Mental Hospital. (With W. W. Eldridge.) American Journal of Roentgenology and Radium Therapy 43: 356-359, March 1940.
- Fong, Theodore C. C., Senior Medical Officer: Therapeutic Quartan Malaria in the Therapy of Neurosyphilis Among Negroes. American Journal of Syphilis, Gonorrhea 24: 133-147, March 1940.
- Duval, Addison M., Senior Medical Officer: Juvenile General Paralysis. (With Jay L. Hoffman.) Journal of Nervous and Mental Disease 90: 19-21, July 1939.
- Simon, Alexander, Senior Medical Officer:
Syphilitic Polyneuritis, a Clinicopathologic Entity. (With Sidney Berman.) Archives of Neurology and Psychiatry 42: 273-285, August 1939.
Treatment of Dementia Praecox by Pharmacological Shock. (With E. H. Parsons and Z. Lebensohn.) Military Surgeon 85: 508-514, December 1939.
- Hoffman, Jay L., Medical Officer: Juvenile General Paralysis. (With A. M. Duval.) Journal of Nervous and Mental Disease 90: 19-21, July 1939.
- Richmond, Winifred V., Psychologist: Psychological Studies in Dementia Praecox. (With I. Kendig.) Ann Arbor, Edwards Brothers, 1940. 211 p.
- Kendig, Isabelle, Psychologist: Psychological Studies in Dementia Praecox. (With W. V. Richmond.) Ann Arbor, Edwards Brothers, 1940. 211 p.
- Cohn, Robert, Assistant Scientist: Electro-encephalographic Studies. (With S. Katzenelbogen.) U. S. Naval Medical Bulletin 37: 596-599, October 1939.
- Haydon, Edith M., Superintendent of Nurses: Textbook of Psychiatry. (With Arthur P. Noyes.) 3d edition. New York, Macmillan, 1940. 315 p.
- Earle, Elizabeth C., Assistant Chief Nurse: Anatomy and Physiology. (With Frederick T. Jung and A. R. Benjamin.) Philadelphia, Davis, 1939. 637 p.

COLUMBIA INSTITUTION FOR THE DEAF

Percival Hall, President

DURING the fiscal year which ended June 30, 1940, there were under instruction in the advanced department of the institution, known as Gallaudet College, 96 men and 65 women, a total of 161, representing 40 States and the District of Columbia. This was an increase of 10 as compared with the preceding year.

In the primary and grammar department, known as the Kendall School, there were under instruction 28 boys and 45 girls, a total of 73. This was a decrease of 4 as compared with the preceding year. Of the total in this department, 69 were admitted as beneficiaries of the District of Columbia.

There were admitted to the institution 31 males and 27 females; discharged, 29 males and 20 females.

COURSES OF INSTRUCTION

A revision was carried out in the course of instruction in the advanced department, calling for more teaching of principles of education and psychology and fewer hours of Latin. Additional courses were offered in orientation, hygiene, and appreciation of art.

THE NORMAL DEPARTMENT

Since 1891 a normal department has been maintained in connection with the institution. The fellows in this department are appointed for one year's instruction. They are hearing graduates of colleges of good standing. Six young people—two young women and four young men—were trained during the past year, and all received appointments to teach in various schools for the deaf. The services of this group of young people have been eagerly sought for by the authorities of schools for the deaf. A recent check of the activities of the graduates of this department shows 28 at the head of various schools in this country and abroad, and 27 as principals of school departments.

HEALTH

Good health prevailed during a large part of the school year. During the winter, however, there were many mild cases of influenza. There were three cases of appendicitis requiring operation. In all three cases the operation was successful. There were no deaths among the students during the year.

Our institution physician has for many years worked on the prevention of disease among our pupils and students, and by careful physical examination and inoculation, our school population has escaped serious contagious diseases for many years.

The dining rooms were furnished with a plentiful supply of high-grade milk from our own farm during the year, and wholesome food was provided for all. Weight charts of all students and pupils were kept and examined at intervals to determine if special diets were required in particular cases.

NEEDS OF THE INSTITUTION

The dormitory space in the buildings assigned to the children of the Kendall School and the students of the college is now all taken up. There is urgent need for a library and recitation building, which has been requested for several years and approved by the Secretary of the Interior but not yet granted by Congress.

By the provision of this building, rooms would be vacated in the men's dormitory that would allow an increase of 15 to 20 men students.

SEVENTY-FIFTH ANNIVERSARY

The final chapter in the celebration of the seventy-fifth anniversary of the advanced department of the institution was the holding of a regular meeting of the Conference of Executives of American School for the Deaf in our institution during the month of October 1939. Between 40 and 50 heads of schools in the United States and Canada attended the meeting, and distinguished guests from Johns Hopkins University and the George Washington University, as well as members of our own faculty, took part in the program. The president of this institution was elected president of the conference, and the vice-president, secretary, treasurer, and chairman of the executive committee are all graduates of our normal department.

PRESENTATION DAY

The seventy-sixth commencement of the collegiate department was held on Saturday, June 1, 1940. Six students received the degree of

master of arts in the normal department; 14, the degree of bachelor of arts, and 12, the degree of bachelor of science.

RECEIPTS AND EXPENDITURES

The total receipts, including balance on hand July 1, 1939, were \$199,631.70. Expenses were \$196,331.04. A reserve of \$507.32 was returned to the treasury, leaving a balance of \$2,793.34.

FREEDMEN'S HOSPITAL

Dr. T. Edward Jones, *Director in Chief*

A MOMENTOUS event occurred in the history of Freedmen's Hospital during the fiscal year just closed.

By virtue of the authority contained in section II (e) of Reorganization Plan IV made effective June 30, 1940, by Public Resolution No. 75, Seventy-Sixth Congress, approved June 4, 1940, the following order was promulgated by the Administrator of the Federal Security Agency for the guidance of all concerned:

1. Freedmen's Hospital and its functions shall be administered under the direction and supervision of the Federal Security Administrator through the Surgeon General of the Public Health Service. Subject to the provisions of Agency Orders No. 5 and No. 6, the service facilities of the Public Health Service shall be made available to and utilized by Freedmen's Hospital. The Cooperative Agreement for the Management and Operation of Freedmen's Hospital, executed October 27, 1939, by the Secretary of the Interior, the President, and the Acting Secretary of the Howard University shall remain in full force and effect.

The reorganization plan thus transferred Freedmen's Hospital from the United States Department of the Interior which had exercised supervision for more than 70 years. The growth and expansion of Freedmen's Hospital during that period of time can be depicted as follows:

Its establishment as a Bureau for the relief of freed men and refugees dates back to an act of Congress dated March 3, 1865.

During the years 1868-69 the Freedmen's Hospital permanent quarters were built; a brick building 54 by 100 feet and three frame wards 24 by 120 feet were constructed. The ground surrounding them covered a space of nearly 4 acres. The third and fourth stories of the brick building were occupied by the medical department of Howard University, and the rest of the building along with the frame wards were used for hospital purposes.

The hospital is now comprised of nine buildings situated within a square bounded by two city blocks on either side. Provision is made for both indigent and pay patients without regard to legal residence.

PROFESSIONAL ADVANCEMENT

The visiting (attending) staff has grown from approximately 10 in 1869 to 85 during the fiscal year ending June 30, 1940. There is also

a professional staff of 17 internes, 8 assistant residents, and 4 residents. The members of this staff are the immediate aides to the visiting staff.

TRAINING SCHOOL FOR NURSES

Freedmen's Hospital Nurse Training School, established in 1894, gives young women theoretical and practical instruction in trained nursing. Upon graduation they are eligible for membership in graduate nurse associations, and for State boards examination. The Training School for Nurses graduates annually approximately 12 percent of all colored nurses graduating from schools within the United States. The present director of nurses of Freedmen's Hospital is a product of its school.

HOWARD UNIVERSITY RELATIONSHIP

Freedmen's Hospital is the training center for the students of Howard University School of Medicine. This school graduates annually upward of 40 percent of all Negro medical graduates in the United States. Both institutions are rated class A by the American College of Surgeons.

The close affiliation of Howard University School of Medicine with Freedmen's Hospital, which has existed since the founding of the school in 1867, was further strengthened by the Cooperative Agreement for the Management and Operation of Freedmen's Hospital executed October 27, 1939, by the Secretary of the Interior and the President, and the acting secretary of the Howard University. This agreement definitely outlines the functions of each, and enhances the value of these two institutions as an efficient training center for the medical profession.

ACTIVITIES AND ACHIEVEMENTS FOR THE FISCAL YEAR 1939-40

One of the most outstanding achievements is the addition of a tuberculosis unit building of 150-bed capacity. This unit is the result of an allotment of \$700,000 by the Public Works Administration, for its construction and equipment. Its available occupancy January 1, 1941, will do much toward the establishment of an adequate number of beds for tuberculous patients.

Lowered Mortality Rate

	Number indoor patients treated	Mortality rate
Fiscal years:		
1939.....	6,710	0.055
1940.....	6,980	.045
Reduction.....		.010

ACCOUNTING SYSTEM

Approving a request from the director in chief of Freedmen's Hospital, the Secretary of the Interior invited the General Accounting Office to make a comprehensive survey of the accounting needs and requirements of Freedmen's Hospital. The purpose of this survey was to develop and install a standardized accounting system and procedures for the purpose of furnishing accurate and essential data to the Congress, the Bureau of the Budget, the Department of the Interior, and the administrative officers of Freedmen's Hospital.

As a result of the survey, a standardized system of general ledger and allotment ledger control accounts was installed. The sum of the benefits derived from the installation of this system are as follows:

1. Increased collections of moneys due the hospital from pay patients.
2. Coordination between the various pay units of the hospital and the collection department.
3. Establishment of uniform standards to be used in determining patients' ability to pay for services.
4. Administrative approval for the reduction or cancellation of erroneous pay patients' accounts.
5. Uniform and consistent issuance of formal receipts.
6. Prompt recording and depositing of payment by patients.
7. Periodic billings to all hospital debtors.
8. Development of new income by claims for service rendered in incident and compensation cases against insurance companies.
9. Improved control over stores and equipment.
10. Improved and uniform purchasing procedures.
11. Establishment of accurate accountability for retirement funds.

The procedures encompassed within the system installed have resulted in a substantial reduction of hospital expenditures.

Subsequent to the original request and at the informal suggestion of the Bureau of the Budget, in order to facilitate the preparation of statements of expenditure required by the Bureau of the Budget, the Department of the Interior, and Freedmen's hospital, it was decided to develop a standard cost distribution system for Government hospitals and utilize the experience gained at Freedmen's Hospital for this purpose. This was accomplished through the departmentalization of the various units of the hospital together with a classification by objects of expenditure by departments. This standard system of cost distribution provides accurate data for the preparation of operating statements and administrative reports, a careful study of which by the administrative officials tends toward a more economical and efficient operation of the hospital, as well as providing the Bureau of the Budget with adequate information for comparison with operating costs of other Government hospitals looking to the ultimate development of true and factual standards of efficient administration and professional service.

FILING SYSTEM

A comprehensive filing system has been completed by a corps of District of Columbia W. P. A. workers.

Work on the project started July 5, 1938. As many as 43 qualified typists, clerical workers, and other white-collar workers were engaged at peak employment.

In setting up the case record files, the W. P. A. workers transcribed several thousand such records to assure their future existence. Index cards briefly recording other case histories, dating from 1881, also were made a part of the records.

Other accomplishments include the arrangement, classification, codification, and filing of 10,000 emergency patients' cards, as well as the rearrangement in chronological sequence of the hospital census sheets dated July 1907 to the present.

On September 8, 1938, a unit history system for in-patients was installed, thus bringing together in one folder all hospital admissions regardless of the number of times a patient is admitted.

A similar system was installed at the same time for the out-patient records, however, existing personnel and space have not been adequate to combine the two systems so that there would be actually one unit system which includes both in-patient and out-patient records.

A lack of sufficient personnel is at this time a distinct handicap to the efficiency and completeness of this system.

GROWTH EXCEEDS PHYSICAL CAPACITY AND PERSONNEL

The continued rapid growth of activities has overtaxed the physical capacity of the hospital as well as its personnel and equipment. The attendance upon our out-clinics was:

Fiscal year:

1938	55,304
1939	73,196
1940	82,751

OBSTETRICAL DEPARTMENT

Fiscal year:

1938	951
1939	1,050
1940	1,271

IN-DOOR PATIENTS

Fiscal year:

1938	6,225
1939	6,710
1940	6,980

HOWARD UNIVERSITY

Mordecai W. Johnson, *President*

GENERAL TREND OF THE UNIVERSITY

THE year 1939-40 was the seventy-seventh year of the emancipation of the slaves, the seventy-third year of the operation of Howard University, the sixty-first year of the Government support of Howard University, the eleventh year since the passage by Congress of the basic law authorizing annual appropriations in support, construction, and maintenance of the university, and the ninth year of the Government's ten-year program to establish Howard University on a sound basis of functioning as a first-class university service.

Student body and resources.—In the year 1939-40 Howard University had a student body of 2,338 students from 40 States and 14 foreign countries, and a faculty of 259 teachers (equivalent to 183 on full-time). Degrees were awarded to 259 graduates in 10 schools and colleges, including the graduate school, the college of liberal arts, the school of engineering and architecture, the school of music, the college of medicine, the college of dentistry, the college of pharmacy, the school of law, the school of religion, and the summer school. The institution had a physical plant valued at \$7,560,411, total assets of \$9,769,829, and an income for current purposes of \$1,164,214. It was receiving the support of the Congress of the United States, the Public Works Administration, the Works Projects Administration, the National Youth Administration, the General Education Board, the Julius Rosenwald Fund, and other private foundations and individuals.

Status and progress under 10-year plan.—During the period since the passage of the substantive law in 1928, including 9 years of the 10-year program, the capital assets of the university have been more than trebled, its book collection more than doubled, and its movable and flexible scientific and educational equipment modernized and trebled. The total number of teachers increased by 60 percent and the total number of full-time teachers increased by 98.7 percent, so as to place 88 percent of instruction in their charge. The university as a whole has moved 72 percent of the way toward a first-class faculty and administrative staff, 67.5 percent of the way toward first-class ade-

quacy in flexible and educational scientific equipment and supplies, and more than 50 percent of the way toward a first-class educational plant.

Physical-plant improvements.—During the year one main building was under construction. The new men's dormitory, made possible by an appropriation of \$646,200 from the Federal Public Works Administration, was finished, dedicated as the George W. Cook Hall, and turned over to the university by the Secretary of the Interior.

There were three projects financed by the Works Projects Administration during the year 1939-40—one painting and two landscaping projects. Under the painting project 17 buildings received interior painting and 5 buildings received exterior painting, totaling approximately 1,100,000 square feet of work. Fencing and lamp standards were painted also.

Under the first landscaping project, the parking area at the medical school was enlarged, about 6,600 square yards of grading and 1,100 square yards of seeding were completed, a flight of concrete steps was constructed, approximately 2,300 trees were planted and about 6,000 plants were cultivated. Under a second project which was in progress at the close of the fiscal year, approximately 40,000 square yards of lawn had been renovated and about 1,600 trees and shrubs had been planted. The value of all landscape work done under these projects during the year was approximately \$19,000.

Increased number and caliber of students.—The enrollment of 2,338 students in 1939-40 represents a total gain of 712 students since the low point of the depression in 1933-34. The university was being fed at its base (the college) by 140 high schools and at its summit (the graduate school) by 67 colleges and universities. In the professional schools of medicine, dentistry, law and religion, 77 percent of the students were holders of college degrees as compared with 70 percent for the preceding year and 665 or 28 percent of all students in the university were persons holding one or more advanced degrees.

Graduates of the college of medicine continued to maintain a high record before State examining boards. Thirty-three were examined by 12 medical State boards in 1939. Of these, 31 passed and 2 failed.

Four additional divisions of the university accredited.—In October 1939 Howard University was placed on the list of accepted institutions by the Association of American Universities, the highest of the rating agencies for universities and colleges. In May 1940 the division of social work of the graduate school was admitted to membership as a type I member school in the American Association of Schools of Social Work. In December 1939 the American Association of Theo-

logical Schools placed the school of religion on its list of accredited theological schools. In January 1940 the college of pharmacy was accredited by the American Council on Pharmaceutical Education.

Successful civilian pilot training program.—Howard University participated in the civilian pilot training program of the United States Civil Aeronautics Authority. This program offered an opportunity for young Negro college students to obtain flight training under the leadership of the school of engineering and architecture. Ten Howard students were admitted to the course. Of these nine successfully completed the course and received private pilot certificates. Three were recommended for the advanced pilot training program.

Division of social sciences sponsors public lectures.—On May 15-16, 1940, the division of social sciences of the graduate school sponsored a series of public lectures which covered aspects of the life of Negro peoples in the independent American nations, Canada and the British West Indies. These lectures were presented for the purpose of adding to the knowledge of the subject and stimulating consideration of the future prospects of race relations in the Western Hemisphere.

Progress of the special Negro library collection.—From the standpoint of library resources, the one unique collection which Howard University has been developing is that composed of material by and about Negroes. This collection, known as the Moorland Foundation, has grown from a total of 5,449 books and periodicals in 1934-35 to 11,796 books and periodicals and Howard masters' theses. In addition, the nature of the material acquired becomes increasingly more varied. Manuscript letters, musical compositions (both printed and manuscript), broadsides, programs, photographs, pictures, maps, photostats, microfilms, college catalogs, etc., are included in the acquisitions of the collection.

Postgraduate courses established in dentistry.—The university took a forward step in approving a plan for the college of dentistry to inaugurate a postgraduate course beginning in the summer of 1940. The provision of postgraduate instruction is one of the most fundamental needs of the Negro practitioner of dentistry today.

College of liberal arts takes important steps to improve quality of instruction.—The college of liberal arts inaugurated several important changes designed to improve the quality of instruction and the caliber of the students. A new advisory system was set into operation for the first time in the college. Every student is now under an advisor during his entire time in the college.

Admission requirements have been raised. Instead of admitting unconditionally every student who has 15 acceptable units from an

accredited high school, only those students graduating in the upper half of their class are admitted unconditionally. Students graduating in the lower half of their class are admitted on trial and must maintain an average of C during their first year in the university, based on at least 20 semester hours of work.

Graduation requirements have also been raised in one important respect. Whereas formerly a student could present toward graduation not more than 20 semester hours of D grade, now a student ceases to be a candidate for graduation when he has accumulated more than one-fifth of the credits required for graduation (normally 24 semester hours), with grade of D, E, F, and WF. While the new rule may allow a slightly larger number of D's than formerly it is much more stringent because it includes failing grades as well as D's.

The school of religion makes significant advances.—The school of religion acquired during the year one of the finest library collections of its size in the United States. The collection included 39,000 volumes. It was purchased from the Auburn Theological Seminary for \$10,000, made possible by the trustees of the Pillsbury Fund who made a gift of \$6,000 and granted the university an additional loan of \$4,000 to make up the full purchase price. The school of religion library now totals approximately 47,000 volumes.

During the year the school of religion moved into its new home, formerly the Carnegie Library Building. With a new home, library and accreditation by the American Association of Theological Schools, the school of religion now takes its place as one of the strongest divisions of the university.

School of law gives decisive help in important civil rights cases.—The members of the faculty of the school of law continued to be active in the rendering of uncompensated legal services in matters of general public concern. Faculty members of the school of law were leading advocates in litigation challenging racial salary discriminations in the compensation of public school teachers and in legal efforts to obtain for Negroes equality of opportunity for graduate and professional training.

Medical school continues to go forward.—The most significant event relating to the medical school during the year was the signing of an agreement between the board of trustees of Howard University and the Secretary of the Interior which provides for a more satisfactory relationship between the college of medicine and the Freedmen's Hospital. This agreement places the responsibility for the professional services of the hospital on the college of medicine of Howard University. This responsibility will enable the college of medicine to carry out a pro-

gram of medical education in the hospital as a first class university teaching hospital.

This agreement becomes even more significant with the near completion of the 150-bed tuberculosis annex at Freedman's Hospital, made possible by a grant of \$600,000 from the Public Works Administration. The value of facilities for clinical training in tuberculosis which will be available to our medical students cannot be overestimated.

With the appointment of a member of the full-time staff as professor and head of the department of obstetrics and gynecology, all the departments of instruction in the college of medicine were provided with full-time leadership for the first time. This step constitutes a decisive improvement in the clinical branches of medicine.

Outstanding needs of the university.—The outstanding needs of the university, made increasingly clear during the year, were: (1) Immediate increases in the number of teachers in the graduate school, in the clinical branches of medicine and in the school of engineering and architecture; (2) an increase of 30 in the number of mature teachers of professorial rank; (3) an increase of \$7,000 annually to make important supplements to the gravely deficient book collection in our library; (4) the doubling of funds for scholarships and student aid, especially for teachers in the South, who receive low salaries and may not otherwise find it possible to pursue the graduate work which they need to increase their efficiency; (5) increased funds for at least that minimum of research which is necessary to maintain a living mind in the members of the teaching staff; and (6) the following buildings: (a) A well-equipped building to house the school of engineering and architecture; (b) a modern building and equipment for the work in dentistry; (c) an administration building for the centralization and proper inter-relation of the administrative services of the university; and (d) an auditorium building which would contain provisions for the school of music, the department of art, and the work of dramatics, and (e) an armory to accommodate the Reserve Officers' Training Corps.

STUDENTS

University enrollment.—The total enrollment for the year 1939-40 was 2,338, of whom 1,130 were men and 1,208 were women. Comparison with the previous year is shown in the following:

Summary of Students Enrolled in Howard University for the Years 1939-40 and 1938-39

Division of the university	Net enrollments						Total gain	Total loss
	1939-40			1938-39				
	Total	Men	Women	Total	Men	Women		
THE COLLEGES								
College of liberal arts.....	1,351	587	764	1,383	583	800	-----	32
School of engineering and architecture.....	62	62	-----	59	59	-----	3	-----
School of music.....	83	24	59	92	33	59	-----	9
Graduate school.....	398	136	262	407	164	243	-----	9
Total.....	1,894	809	1,085	1,941	839	1,102	-----	47
PROFESSIONAL SCHOOLS								
School of religion.....	34	32	2	25	25	-----	9	-----
School of law.....	58	56	2	70	69	1	-----	12
School of medicine:								
College of medicine.....	132	118	14	154	142	12	-----	22
College of dentistry.....	69	59	10	51	45	6	18	-----
College of pharmacy.....	38	36	2	31	29	2	7	-----
Total.....	331	301	30	331	310	21	-----	-----
Total in regular courses.....	2,225	1,110	1,115	2,272	1,149	1,123	-----	47
Special students in music, religion, law, dentistry, medicine.....	131	32	99	132	32	100	-----	1
Total.....	2,356	1,142	1,214	2,404	1,181	1,223	-----	48
Less duplications.....	18	12	6	11	8	3	7	-----
Grand total (net).....	2,338	1,130	1,208	2,393	1,173	1,220	-----	55

Geographical distribution.—Of the regular students enrolled for the school year, 1939-40, 95.7 percent came from the continental United States, and 4.3 percent from without the borders of the United States, as compared with 95.9 percent and 4.1 percent, respectively for 1938-39.

Forty states sent 2,082 candidates for degrees in 1939-40 as compared with 40 States sending 2,179 candidates for degrees in 1938-39. The regional distribution of candidates for degrees is as follows: From the North, 509 students distributed as follows: New England, 56; the Middle Atlantic States, 309; the East North Central States, 93; the West North Central States, 51. From the South, 1,562 students distributed as follows: The South Atlantic States, 1,292; the East South Central States, 169; the West South Central States, 101. From the West, 11 students distributed as follows: Mountain States, 4; Pacific States, 7.

Fourteen foreign countries sent 94 candidates for degrees during the school year 1939-40 as compared with 17 foreign countries with a total of 93 candidates for degrees in 1938-39.

Students of graduate caliber.—Two of the professional divisions of the university, pharmacy, and the department of dental hygiene in the college of dentistry, receive students on the basis of regular college entrance requirements. The division of medicine, dentistry, law, and religion require definite amounts of college work. Of the 87 students entering the regular freshman classes of medicine, den-

tistry, law, and religion in 1939-40, 75 or 86 percent entered with college degrees. Two hundred forty-two, or 77 percent, of the 313 students in these 4 professional schools are degree-holding students. Of the 2,338 students in the entire university, 665 or 28 percent, are persons holding one or more advanced degrees as compared with 661, or 27 percent of the 2,393 students in 1938-39.

Scholarships and student aid.—Scholarships within the university continued to be administered on the basis of an allotment of 71½ percent of all students fees as provided by the trustees of the university.

During the academic year 1939-40 the committee on scholarship and student aid received about 1,200 applications for aid. Five hundred and three students, or 21 percent of the student body were awarded scholarships and fellowships of various kinds. Two hundred and seventeen of those aided received work scholarships from the National Youth Administration, totaling \$23,316.45 or an average of \$107.44 per student. The total amount available for scholarships from all sources was \$55,646.77.

One of the most urgent needs of Howard University is a substantial increase in the amount of scholarship funds for the aid of the many needy, worthy students who, without such aid, will be unable to secure the educational advantages which they seek and deserve.

GRADUATES

Number and distribution.—In 1939-40 Howard University had 259 graduates coming from 31 States, the District of Columbia and 3 foreign countries. The following table gives the number of graduates from each division of the university.

Summary of Students Graduated by Howard University for the Years 1939-40 and 1938-39

Divisions of the university	Graduates					
	1939-40			1938-39		
	Men	Women	Total	Men	Women	Total
THE COLLEGES						
College of liberal arts.....	63	70	133	59	92	151
School of engineering and architecture.....	6	—	6	3	—	3
School of music.....	2	5	7	3	1	4
Graduate school.....	15	26	41	20	22	42
Total.....	86	101	187	85	115	200
PROFESSIONAL SCHOOLS						
School of religion.....	4	—	4	5	—	5
School of law.....	17	—	17	22	—	22
School of medicine:						
College of medicine.....	30	2	32	28	2	30
College of dentistry:						
4-year course.....	7	—	7	7	—	7
Dental hygiene.....	—	7	7	—	6	6
College of pharmacy.....	5	—	5	—	1	1
Total.....	63	9	72	62	9	71
Grand total.....	149	110	259	147	124	271

Honorary degrees.—Three honorary degrees were conferred at commencement on June 7, 1940. The degree of doctor of laws was conferred upon John W. Davis, president of West Virginia State College; Myles Anderson Paige, judge of Special Sessions Court, New York City; and Asa Philip Randolph, president of the Brotherhood of Sleeping Car Porters.

Total number of Howard University graduates.—The total number of graduates of Howard University is now 10,796. Of this number the registrar has approximately 6,000 correct addresses in 43 States, the District of Columbia and 15 foreign countries, classified alphabetically by States, cities, sex, schools, and classes.

THE TEACHING STAFF

Number and full-time status of teachers.—There were 259 members of the teaching staff for 1939–40, of whom 161 were full-time teachers and 98 were rendering part-time service, representing together a full-time equivalent of 183.62 teachers.

In 1928 when the trustees began to put the 10-year program into operation, there were 161 teachers in the university, 81 of them being on full-time service and 80 on part-time service. During the intervening period the total number of teachers has been increased by 98 or 60 percent and the total number of full-time teachers has been increased by 80 or 98.7 percent. The full-time teaching staff has now been practically doubled.

This means, in brief, a major improvement that has greatly strengthened the quality of instruction in all divisions of the university, and has substantially transformed the accredited standing of the several schools and colleges. The teaching load in the college of liberal arts, for example, has been reduced by one-half. Eighty-eight percent of the work of instruction in the university is now being done by teachers who are devoting their full time to education.

In relation to this objective of an adequate number of teachers, three divisions of the university require immediate help. These are: (1) The graduate school, where the work of instruction at present falls almost entirely upon the teachers of the college of liberal arts; (2) the clinical branches of medicine; and (3) the school of engineering and architecture, where there has been no full-time additions to the staff during the past ten years although the enrollment has more than doubled in that period.

The maturity of the staff.—On the basis of the 10-year program the present staff of Howard University should have the following distribution: Professors (40 percent) 66, associate professors (10 per-

cent) 16, assistant professors (20 percent) 33, instructors (30 percent) 49.

In 1939-40 the actual staff on full-time and full-time equivalent basis was: Professors (20 percent) 37, associate professors (12 percent) 22, assistant professors (24 percent) 44, instructors and assistants (44 percent) 81. This means that 68 percent of the staff are in the lower two ranks, as compared with the 10-year objective of 50 percent, and only 20 percent are in the professorial rank, as compared with the 10-year objective of 40 percent. The university is still only slightly beyond the halfway mark in the number of mature professors. Thirty such men and women are now needed.

Salaries of teachers.—In spite of the depression and the small increases in income for current purposes, the trustees of the university have persistently endeavored to improve the salary status of the members of the teaching staff. A minimum, average, and maximum salary scale for each rank of instruction was included in the 10-year program. The minimum salary scale has been achieved and surpassed for each rank but the university is still short of the average objectives by the following amounts: Instructors, \$177; assistant professors, \$216; associate professors, \$196; professors, \$829.

Tenure regulations and retirement system.—Regulations governing tenure have been adopted and revised by the trustees after consultation with faculty representatives. Further revision designed to increase security is experimentally under way. A retirement system has been adopted providing an annuity of from one-third to one-half average annual income on payment of premium of 5 percent of the salary by the teacher, matched by similar payment of 5 percent by the university.

Educational assistants, educational and scientific supplies and equipment.—Teaching resources in these items have been trebled during the progress of the 10-year program, but the university is still operating 34.2 percent below the objectives in these fields.

Faculty publications.—Publications of the entire university faculty during the year 1939-40 were as follows: 4 books, 112 scientific and scholarly articles and 19 book reviews. In addition there were 14 other creative contributions such as poetry, paintings, etc. Practically all schools and colleges of the university were represented in these publications and contributions.

THE GRADUATE SCHOOL

Enrollment.—The graduate school is second in enrollment among the schools and colleges of the university. The number of students registered in the school for 1939-40 was 398.

Sources of students and degrees held.—The students enrolled in the graduate school this year came from 30 States, the District of Columbia, and 4 foreign countries. Sixteen Southern and Southwestern States and the District of Columbia, in which separate schools were mandatory, furnished 329 graduate students or 82 percent of the total enrollment.

The students enrolled in the graduate school received their bachelor's degree from 67 colleges and universities. Although the majority of the students in the graduate school are holders of the bachelor's degree 24 held the master's degree prior to entering the graduate school.

Departments of instruction and faculty.—The graduate students for the year 1939-40 did their work in 19 departments of instruction. One hundred and fifty-nine, or 39.9 percent of the students in the graduate school, did their work in the departments of education, psychology, and philosophy. One hundred and eight, or 27 percent did their work in the social sciences of economics, sociology, and social work, history, and political science. Fifty-four, or 13 percent did their work in the natural sciences of mathematics, zoology, chemistry, physics, and bacteriology. Sixty-one, or 15 percent, did their work in English, German, and romance languages. Sixteen, or 4 percent, did their work in art, home economics, and religious education.

Sixty teachers offered courses of instruction in the graduate school during the year 1939-40.

Graduates and degrees conferred.—Forty-one master's degrees were conferred in June 1940. Nine received the degree of master of science, 31 the degree of master of arts, and 1 master of arts in social work.

Future development in graduate work.—The rapid development and accreditation of public schools and colleges for Negroes in the States of their majority residence within the last 10 years has created an acute and growing need for mature teachers with thoroughly competent training on the graduate level. The soundness of the educational structure throughout these States depends primarily upon the caliber of graduate instruction which is made available to meet this situation.

There is yet nowhere among these States a single tax-supported college of liberal arts with a sufficient number of departments of instruction and a sufficient amount of resources for personnel, educational supplies, and equipment to undergird and maintain the establishment of a first-rate graduate school.

Howard University, because of its superior personnel, facilities, and equipment, is still the most promising center for graduate work for Negroes. It is of the utmost importance to the States of the Negroes majority residence and to the Nation that all possible steps be taken

to place and reinforce the graduate work at Howard University on a sound and thoroughly competent basis.

The continuous development of competent research and sound instruction require certain immediate steps. (1) The teaching staff must be supplemented with mature, well-paid scholars. (2) The book collection in the library must be doubled. (3) Scholarships and fellowships must be increased, so that qualified students may not be turned away without assistance. (4) Funds should be made available for faculty research projects and a university press.

THE COLLEGE OF LIBERAL ARTS

Outstanding trends and events.—The outstanding event of the year was the placing of the college on the approved list of the Association of American Universities.

One of the most significant steps which the college has taken in the direction of the improvement of instruction has been the inauguration of a college-wide advisory system, including the practice of giving mid-semester grades.

Enrollment.—The enrollment in the college of liberal arts during the first and second semesters of the year 1939-40 comprised 579 men and 625 women—a total of 1,204 students. The summer school enrollment of college students for 1939 was 218, some 98 of whom were students who were not in school during the regular term, making a combined gross enrollment—including summer school, of 1,351 students for 1939-40.

Graduates.—In June 1940 there were 115 students who graduated from the college of liberal arts.

Faculty.—For the year 1939-40 there were 92 teachers in the college, inclusive of the two Regular Army officers in the R. O. T. C. Of the total, 81 were full-time and 11 were part-time teachers. During the past year 3 members received their doctor's degrees; 6 were on leave of absence acquiring advanced training in their respective fields; 4 did part-time graduate work in 2 local universities.

MILITARY SCIENCE AND TACTICS

Enrollment.—The enrollment in the department of military science and tactics for the year 1939-40 was 370 for the first semester and 332 for the second semester.

Unit rated as "excellent".—Major Harry M. Gwynn inspected the R. O. T. C. unit from May 20 to May 22, 1940. As a result of the inspection, the unit was rated as "excellent," the highest rating authorized by regulations.

Commissions awarded.—Fifteen students were awarded commissions: as second lieutenants, Officers' Reserve Corps, United States Army.

THE SCHOOL OF ENGINEERING AND ARCHITECTURE

General trends.—The Howard University school of engineering and architecture is the only school of its kind in the United States primarily for Negroes. Over one-fifth of the Negro engineers and architects in this country are graduates of this school and approximately one-half of the students now studying engineering and architecture in the United States are enrolled at Howard University.

Enrollment.—During the school year 1939-40, 62 students registered for degrees in engineering and architecture, representing an increase of 2 students over those of the previous year.

Graduates.—At the June 1940 commencement, five students received bachelor of science degrees as follows: One in architecture, three in electrical engineering, and one in mechanical engineering.

Faculty.—The faculty for the year 1939-40 consisted of eight full-time teachers during the first semester and nine during the second semester. Two members of the faculty were on leave of absence, one for the year and one for the second semester. Seven members of the faculty are registered engineers or architects by examination in the States of Alabama, Indiana, Maryland, Ohio, Pennsylvania, Virginia, and the District of Columbia.

THE SCHOOL OF MUSIC

General trends.—The school of music of Howard University offers degree courses in piano, public-school music, organ, voice, and violin, and maintains a junior department for the purpose of developing a larger group of students with sound basic training in music.

With a number of Negro schools and colleges closing their doors to music, the school of music of Howard University has a greater responsibility and obligation than ever before.

Enrollment.—There were 209 students registered in the school of music for the year 1939-40. Eighty-three of these were registered in the regular courses leading to a degree; 96 were enrolled in the junior department, and 30 were special students in the degree departments.

Faculty.—The faculty was composed of 15 teachers during the year 1939-40. Twelve were full-time and three were part-time teachers. One member of the regular staff was on sabbatical leave continuing research in the field of Creole folk music and doing graduate study at Columbia University and the Institute of Musical Art, New York; one received the degree of master of arts in music education from the University of Pennsylvania.

Graduates.—Eight graduates were awarded music degrees in June 1940. Five received the degree of bachelor of music and three received the degree of bachelor of school music.

Outstanding events of the year.—On May 17 and 18, 1940, complete performances of the grand opera Faust were given by the school of music.

The school of music presented on its annual concert series the following artists: The Russian Trio; Egon Petri, pianist; Luther King, tenor; Hugh Porter, organist; Eugenia Buxton, pianist, and Anne Brown, soprano.

The University Glee Club gave a number of concerts, including one at the White House. This was the third appearance there during the last four years. The Women's Glee Club gave five full concerts during the year and made appearances on several university and civic programs.

THE COLLEGE OF MEDICINE

Outstanding events of the year.—In addition to the new relationship between the medical school and Freedmen's Hospital and the placing of all departments of instruction under full-time leadership, referred to above, the medical school continued a program to improve the general health of the Negro population throughout the country.

(1) The postgraduate course in venereal disease control was continued with 13 Negro physicians in attendance.

(2) The second annual conference of Negro tuberculosis workers was held at Howard University on May 27-28, 1940, with 24 Negro physicians specializing in tuberculosis and 96 others attending the conference.

(3) A grant of \$1,200 was made by the National Tuberculosis Association and the American Social Hygiene Society for continuation of the study of the student health program in colleges for Negroes.

(4) Mr. Abraham H. Lichtman donated an incubator for premature infants to the college of medicine, the division of pediatrics, for use in the Freedmen's Hospital. Mr. Lichtman plans to add other such units from time to time until the hospital is adequately provided with facilities for proper care of prematurely newborn babies.

Students.—Of a total of 282 listed applicants, 237 presented the minimum requirements for admission. Of this number 40 were offered admission to the freshman class. Twenty-six of these registered. The greatest number of medical students registered at any time during the year was 122.

Graduates.—At the June commencement the degree of doctor of medicine was conferred upon 33 graduates, 32 of whom have secured internships in approved hospitals, while one plans to pursue graduate study at McGill University.

Faculty.—The faculty for the year consisted of 96 members, 32 of whom were full-time teachers and 64 were part-time. Four members

of the faculty were engaged in graduate study as General Education Board fellows.

THE COLLEGE OF DENTISTRY

General trends.—The most significant trend in the college of dentistry is the continued professional improvement of the staff. Within the last seven years eight members of the staff have completed graduate work in dentistry and are now prepared to render highly specialized services in their respective fields.

Students.—Seventy students were registered in the college of dentistry for the year 1939–40. The total enrollment of 70 is a gain of 19, or 37 percent, over the enrollment of 51 for the year 1938–39. The 24 students in the freshman class for the year 1939–40 constituted an increase of 6 over the 18 students in the entering class of the year 1938–39.

Graduates.—At the June commencement for 1940 there were seven graduates who received the degree of doctor of dental surgery and seven who received certificates in oral hygiene. Five dental graduates have been awarded internship opportunities in leading American clinics.

Faculty.—The faculty for the year 1939–40 consisted of 15 members, 12 of whom were full-time and three were part-time. One member of the regular staff was on leave of absence, doing postgraduate work in the department of oral surgery of the Columbia University School of Dental and Oral Surgery.

THE COLLEGE OF PHARMACY

General trends.—As reported in June 1939 the college still is unable to meet the demands made upon it for graduates or individuals seeking employment in retail pharmacy. The requests come from all sections of the country and offer attractive opportunities. There is no unemployment problem for our graduates.

Accreditation.—In January 1940 the American Council on Pharmaceutical Education published its first list of accredited colleges of pharmacy which included the college of pharmacy of Howard University.

Enrollment.—There were 38 students registered during the year 1939–40 as compared to 31 for the year 1938–39.

Graduates.—In June 1940 five students were awarded the degree of bachelor of science in pharmacy as compared with one in June 1939.

Faculty.—The faculty for the year included one full-time professor in pharmacognosy, one full-time associate professor in pharmacy, two full-time instructors in pharmacy, and one part-time instructor in pharmacy.

Supplies to various departments.—The college purchases, manufactures, and provides at cost all the medicinal preparations used by the University Health Service. The college supplied during the year 1939-40, 2,286 labeled packages ready for dispensing as compared with 1,944 packages in 1938-39, an increase of 342 packages or 17 percent. This represents a saving of approximately \$735 to Howard students. The faculty in 1939-40 filled 260 prescriptions for students, as compared with 192 prescriptions for the year 1937-38.

THE SCHOOL OF LAW

The role of the school of law.—Howard continues to be the only accredited law school south of the Mason-Dixon line which freely admits Negro students and is the only accredited law school in the United States which attempts to offer an adequate, general legal education and at the same time to emphasize and give special consideration to the problems of particular concern to the Negro. Moreover, the facilities of the school for research and the counsel and guidance of the faculty are more than ever in demand for the advancement of legal causes of general importance to the Negro.

Enrollment.—Sixty-one students, 2 of them women, enrolled for the year 1939-40, of whom 19 were regular students enrolled in the entering class.

Graduates.—At the commencement in June 1940, 21 candidates received the degree of bachelor of laws. The ranking member of the graduating class of 1940 has been granted a Rosenwald Fellowship to study at Columbia Law School during 1940-41.

Faculty.—Nine persons constituted the teaching staff of the law school this year. Six rendered full-time and three part-time services. One of this year's teaching staff will study at Harvard Law School during 1940-41 as a Rosenwald fellow.

Library.—The total number of volumes now in the law library is 21,240. During the current year 670 volumes were purchased and 330 were acquired by gift. A full-time librarian with the rank of assistant professor of law was appointed to take office in September 1940.

THE SCHOOL OF RELIGION

Financial support.—The school of religion receives no aid from Government funds. Its work is maintained entirely by endowments, private gifts, and funds.

General trends.—Beginning in 1932, only college graduates have been permitted to matriculate as regular students in the school of religion. Each year since that time there has been a gradual increase in enrollment, from 5 students in 1932 to 41 in 1939-40.

Accreditation.—The American Association of Theological Schools, on December 1, 1939, placed the school of religion on its list of accredited theological schools.

Enrollment.—There were 41 students enrolled in the first semester and 43 (2 of whom were auditors) in the second semester in the year 1939–40.

The school has been interdenominational from its very beginning. Nine denominations were represented by the students during the past year.

Graduates.—Eight students were graduated from the school of religion on June 7, 1940. Four received the degree of bachelor of divinity and 4 received the master's degree in religious education.

Faculty.—The faculty for the year 1939–40 consisted of four full-time teachers and seven part-time teachers.

THE LIBRARY

Gifts.—The outstanding gifts this year were: Dr. Jesse E. Moorland, deceased Howard trustee, 2,776 books on the Y. M. C. A., Negroes, art, music, law, religion, and the social sciences, 2,531 periodicals, 8,958 pamphlets, 16,000 clippings, 27 scrapbooks, and a first edition of *The New York Conspiracy*, our most valuable book; the estate of William H. Baldwin of Washington, D. C., 66 books, 28 pamphlets, and 279 periodicals on social problems; Mrs. Amy Spingarn, 663 letters of Dr. Joel Spingarn concerning the American Conference, the Des Moines Training Camp, and the National Association for the Advancement of Colored People; the late Prof. Kelly Miller, 435 letters concerning the National Negro Library and Museum; Mrs. Walter H. Pinchback, 153 documents, addresses, letters, and circulars relating to the latter's public life; and Augusta Savage, sculptress, bust of a Negro Woman—her own work.

Statistics for the university libraries.—The total number of books, periodicals, and pamphlets in the university is now 131,431, of which 110,191 are carried on the main library accession records, while the remaining ones are in the law library uncataloged collection. During the year there were accessioned by the main library 11,481 volumes. This number includes 4,482 new books purchased, 5,996 gifts (mostly accumulated material received in previous years), and 430 books added by binding. There were classified or cataloged 7,383 titles and 14,179 items. Eight hundred and forty-three periodical titles were received by all libraries. The circulation record in all libraries was 167,529.

FINANCES

Assets.—The total assets of the university on June 30, 1940, were \$9,769,828.71. Of the total assets, the sum of \$1,102,849.30 represents assets in the physical plant extension fund, made possible through private gifts of the General Education Board and the Julius Rosenwald Fund, and through rentals of the property purchased by the gifts of these funds; \$980,913.42 represents endowment (an increase of \$1,815.21); \$7,560,410.83 represents plant fund assets (an increase of \$244,580.82 since the report of June 30, 1939); \$1,368.30 represents a small loan fund for students in the school of medicine. The remaining \$124,286.86 represents assets of the current fund.

Income and expenditures.—The total income for the year 1939–40 was \$1,377,841.54, including current and capital funds. This represents \$231,646.06 less than the total income for the year 1938–39. Gross income for current purposes was \$1,164,213.72, representing an increase of \$16,353.69 over the income for current purposes for 1938–39. Of the total income for current purposes the Government contributed \$753,297.34, or \$29,932.57 more than the Government contributed for 1938–39. The income for current purposes from private sources in 1939–40 was \$410,916.38 which was \$13,578.88 less than the income for current purposes from private sources in 1938–39.

The total expenditures for all purposes, current and capital, for the year 1939–40, were \$1,389,216.32, representing a decrease of \$227,302.27 in the total expenditures as compared with the year 1938–39. The total current expenditures for the year 1939–40 were \$1,175,588.50, representing an increase of \$20,697.48 over the current expenditures for the year 1938–39.

The audit of funds.—The auditing of all the university's accounts has been done by certified public accountants. All moneys appropriated by the Congress and the Public Works Administration were expended under the supervision of the Secretary of the Interior.

INDEX

	Page		Page
Bituminous Coal Division	451	Biological Survey, Bureau of—Continued.	
Board's part important.....	458	Cooperative control of injurious animals...	282
Coal Act constitutional.....	452	Predatory-animal control.....	282
Coal vital to national defense.....	453	Benefits of predator control.....	284
Cooperating in national defense.....	456	Cases of predation.....	283
Condition of the coal industry.....	451	For depredation control.....	282
Conditions grew worse.....	455	Rodents and communicable dis-	
Constitutionality of the act.....	464	eases.....	285
Constitutionality of regulatory provi-		Rodent control.....	285
sions.....	464	Benefits of rodent control.....	286
Delegation of legislative power as		Instances of rodent and rabbit	
to price fixing.....	464	damage.....	286
Due process.....	464	Economic research on wildlife.....	240
Power under the commerce clause.....	464	Cooperative food habits research.....	243
Injunction.....	465	Laboratory research on food habits...	243
Other litigation.....	465	Investigations of wildlife research	
Pending and prospective litigation....	468	units.....	243
Status sunshine coal as bituminous...	465	Mosquito control and wildlife habitat...	242
Validity of the 19½ percent tax provi-		Canada goose management studies...	242
sion.....	464	New food habits laboratory at Patux-	
Division took over work.....	456	ent research refuge.....	244
Industry cooperators.....	458	Aid to Federal, State, and other	
Minimum prices now in effect.....	456	agencies.....	244
Not remaking industry anew.....	453	Research in control of harmful mam-	
Prices kept below cost.....	452	mals.....	247
Proceedings for establishment of minimum		Predator studies.....	247
prices and marketing rules and regula-		Studies of injurious birds.....	245
tions.....	461	Robin and oriole damage to grapes...	245
Results cannot yet be related.....	457	Studies of nutrition and physiology of	
Sales agents governed.....	460	upland game birds.....	245
Proceedings instituted by the Com-		Crow depredation on nesting game	
mission.....	461	birds.....	246
Substitutions are provided.....	459	Duck injury to peas and grain....	246
Thirty-nine exemptions granted.....	461	Merganser damage to game fish....	246
Continuation of proceedings by the		Other bird-control activities.....	246
Division.....	462	Repellent experiments.....	247
Effective date of minimum prices and		Sandhill crane damage to grain....	246
marketing rules and regulations.....	463	Waterfowl-management investiga-	
Establishment of minimum prices and		tions.....	240
marketing rules and regulations....	463	Ecological and management	
Examiner's report—exceptions thereto		studies.....	240
and argument before Director.....	462	Reconnaissance of refuges and	
Review by Secretary of the Interior...	463	refuge sites.....	241
Twelve thousand three hundred code		Redhead duck management	
members.....	459	studies.....	242
Waste is tremendous.....	454	Suppression of waterchestnut.....	242
		Waterfowl-nesting studies.....	240
Biological Survey, Bureau of	223	Federal aid in wildlife respiration...	256
Acquisition of land for refuges.....	261	Biological Survey and wildlife inven-	
Administration of wildlife conservation		tories.....	256
laws.....	275	Fur-animal conservation and restoration...	248
Regulatory action.....	276	Cooperative investigations.....	249
Work of game-agents.....	276	Fur-fiber investigations.....	250
Apprehensions under various stat-		Nutritional studies.....	250
utes.....	277	Fur Animal Experiment Station,	
Under-cover operations.....	277	N. Y.....	251

	Page		Page
Biological Survey, Bureau of—Continued.		Biological Survey, Bureau of—Continued.	
Fur-animal conservation and restoration—Continued.		Research on wildlife status and management—Continued.	
Fur Animal Field Station, N. D.	252	Waterfowl situation	229
Fur production and the fur trade	248	Investigations in Alaska	230
Fur supply and annual take	248	Investigations in Canada	229
Laboratory investigations	248	Investigations in Mexico	231
Reproduction studies	249	Investigations in the United States	231
Selling Federal furs	249	Wildlife relationships to forest and range	235
Silver fox quota	248	Distribution and migration records	235
War and the fur trade	248	Wildlife management research	237
Rabbit Experiment Station, Calif.	251	Cooperative research units	237
Karakul sheep studies	251	Wildlife conservation in Alaska	287
Importation and other permits issued	279	Biological investigations	289
Permits under the Migratory Bird Treaty Act	281	Changes in regulations	287
For propagation	281	Law enforcement	288
For scientific purposes	281	Predator control	289
Mammals	281	Wildlife restocking projects	288
Regulations	279	Wildlife-disease research	252
Species entered under permit	279	Fur-animal disease control	252
Species excluded	279	Game-bird diseases	253
Birds	280	Infectious diseases in big game	253
Introduction	223	Physical properties of quail feeds studies	253
Dissemination of wildlife information	228	Range-improvement studies	255
Organization changes	225	Research on national park wildlife	254
Other events of the year	225	Wildlife relationships	254
Fur-production investigations	226	Board of Geographical Names	469
Other wildlife studies	226	Advisory Committee	469
Pest control	228	Executive Committee	470
Research on game birds	225	Geographic distribution of names	470
Wildlife restoration	227	Sources of requests for decisions	470
National wildlife refuge program	265	Bonneville Power Administration	127
Administration and management of refuges	265	Many new industries possible	128
Big game preserves and ranges	268	Marketing proceeds rapidly	129
Bird refuges	266	Prime power contracts executed as of September 14, 1940	130
Increased use by wildlife	266	New power plays defense role	127
New refuges	266	Reconstruction speeded	131
Development of refuges	269	Six hundred miles of line complete	131
Biological development	270	Substation program extensive	132
Civilian Conservation Corps development of refuges	271	Civilian Conservation Corps	401
Cooperation with the Works Projects Administration	273	Activities in national parks	403
Inspection of proposed drainage projects	273	Cooperate in wildlife conservation	406
Engineering work	269	General Land Office camps	401
Public use of refuges	274	In the territories	405
Economic uses	274	Indian C. C. C. program	402
National Youth Administration assistance	274	Non-Federal areas benefited	405
Recreational facilities	275	Range rehabilitation advanced	406
Research on wildlife status and management	229	Training important feature	404
Banding game and other birds	233	Work in reclamation	402
Additional birds banded	234	Columbia Institution for the Deaf	496
Bird-banding cooperators	233	Courses of instruction	496
Return and recovery records	234	Health	497
Biological investigations on wildlife refuges	236	Needs of the institution	497
Funds available	229	Normal department	496
Other migratory game birds	232	Presentation day	497
Work on federal refuges	233	Receipts and expenditures	498
State biological surveys and faunal studies	239	Seventy-fifth anniversary	497

	Page		Page
Director of Forests, Office of	214	Fisheries, Bureau of—Continued.	
Business management.....	217	International relations.....	293
Custodian of vast land areas and diverse forest resources.....	215	Halibut investigations.....	293
Forest protection.....	218	Japanese activities in Bering Sea.....	300
Forestry problems handled.....	216	Administration of fishery laws and regulations.....	301
National defense.....	214	Propagation and distribution of food and game fishes.....	306
Report to the Joint Congressional Committee on Forestry.....	215	Fishery Market New Service.....	311
		Propagation of commercial species.....	307
Exhibits, Office of	477	Anadromous species, Atlantic coast.....	308
The year's accomplishments.....	477	Commercial species, interior waters.....	309
		Game species.....	309
Fisheries, Bureau of	291	Pacific salmon.....	307
Alaska Fisheries Service.....	301	Upper Mississippi wildlife and fish refuge.....	310
Alaska Fur-Seal Service.....	303	Protection of seal, otters, walruses, and sea lions.....	306
Foxes.....	305	Summary.....	292
Fur-seal patrol.....	306		
Fur-sealskins taken by natives.....	305	Freedmen's Hospital	499
Sale of sealskins.....	305	Accounting system.....	501
Seal herd.....	304	Activities and achievements for the fiscal year 1939-40.....	500
Teak of sealskins.....	304	Lowered mortality rate.....	500
Products of the fisheries.....	303	Filing system.....	502
General activities.....	303	Growth exceeds physical capacity and personnel.....	502
Appropriations.....	329	Howard University relationship.....	500
Protection of fish runs from engineering developments.....	329	Professional advancement.....	499
Biological fishery investigations.....	317	Training school for nurses.....	500
Agricultural investigations.....	326		
Great Lakes fishery investigations.....	324	General Land Office	134
Long Island cooperative investigation.....	320	Alaska.....	154
Middle and South Atlantic fishery investigations.....	319	Alaskan Fire Control Service.....	143
North Pacific and Alaska fishery investigations.....	321	Protection of forests on public lands in Alaska.....	143
Pacific pilehard investigations.....	323	Program.....	144
Shellfish investigations.....	325	Aviation leases.....	154
Shrimp investigations.....	320	Carey Act.....	153
Sponge investigations.....	326	Cadastral engineering service.....	139
Water quality investigations.....	328	Accepted surveys and resurveys.....	139
Construction activities.....	299	Conservation of forest resources on the Oregon and California revested lands in Oregon.....	144
Cooperation with Federal, State, and other agencies.....	298	Conservation program.....	144
Division of Fishery Industries.....	311	Fire hazard reduction.....	145
Economic and marketing investigations.....	316	Fire suppression.....	145
North Atlantic fishery investigations.....	317	Miscellaneous.....	145
Statistical investigations.....	312	Reforestation.....	145
Canned fishery products and by-products.....	314	Safety program.....	145
Cold-storage holdings of fish.....	314	Telephone lines.....	145
Landings at certain important United States ports.....	313	Tree and plant disease control.....	145
Sectional surveys.....	313	Truck trail construction.....	144
Shad and Alewife fisheries.....	313	Control of coal fires in Wyoming.....	145
Technological investigations.....	314	Maps, plats and diagrams.....	139
Manufacture of fishery byproducts.....	315	Photolithographic copies, etc.....	139
Nutritive value of aquatic products.....	315	Filing of plats of survey.....	157
Preservation of fishery products for food.....	315	Civilian Conservation Corps.....	144
Sponge market, Tarpon Springs, Fla.....	314	Color of title.....	154
International Pacific Salmon Fisheries Commission.....	295	Contests, other than mineral contests.....	157
		Desert-land entries.....	152
		Exchanges.....	155
		Exchanges with States.....	154

	Page		Page
General Land Office—Continued.		General Land Office—Continued.	
Federal reclamation projects	152	Township diagrams	158
Forestry on the revested and reconveyed		Tract book notations	158
lands in western Oregon	140	Withdrawals and restorations	158
Corrective legislation	140	Final entries, or entries based on final	
Forest policy	140	certificates issued during the fiscal	
Progress in organization	141	year ended June 30, 1940	160
Resources	140	Lands patented with mineral reserva-	
Results of operations	142	tions	161
Grazing leases	155	Summary of mineral lands with-	
Homestead entries	157	drawals and classifications out-	
Indian lands and claims	155	standing on June 30, 1940	161
Land classification	146	Leases other than mineral, outstand-	
Classification reports	146	ing on June 30, 1940	160
Federal land inventories	147	Mineral leases, permits, and leases out-	
Land classification in Alaska	147	standing June 30, 1940, by classes ..	159
Mineral reservations in outstanding		Original entries and selections made	
patents	147	during the fiscal year ended June	
Need for better records	148	30, 1940	160
Objectives	146	Patents issued and certifications	
Organization and problems	147	having the effect of patents made	
Planning a public domain	147	during the fiscal year ended June 30,	
Research and analysis	147	1940	161
Town site project	148		
Leases other than aviation, grazing, and		Geological Survey	39
mineral	156	Alaska Branch	50
Mineral leases and mining claims	151	Field work	51
Coal, potash, phosphate, sodium, and		Office work	52
sulphur permits, leases, and licenses ..	151	Reports and maps	53
Mineral applications and entries	152	Appendix	78
Mineral contests	152	Appropriations and expenditures	74
Oil and gas leases and permits	151	Conservation Branch	66
Miscellaneous	156	Mineral Classification Division	67
National forest homestead lands	157	Water and Power Division	67
Pittman Acts	153	Mining and Oil and Gas Leasing Divi-	
Private land claims	156	sions	68
Public lands	138	Public land	69
Areas under lease	138	Public works projects	70
Pending entries	138	Indian land	70
Surveyed and unsurveyed public		Naval petroleum reserves	70
lands	138	Summary of field activities, by States ..	71
Vacant and unreserved public lands;		Geologic Branch	41
grazing districts	138	General studies	41
Withdrawn and reserved areas	138	Work of the year, by States	44
Public sale and timber and stone applica-		Library	74
tions	157	Topographic Branch	53
Railroad grants and selections	154	Field surveys	55
Range Development Service	142	General office work	53
Allocation of funds	142	Cartography	54
Appropriation	142	Computing	53
Range improvements	143	Inspection and Editing	54
Range program	143	Photomapping	53
Receipts and expenditures	148	Map Information Office	55
Distribution of receipts	149	Work of the year, by States	55
General	148	Water Resources Branch	58
Receipts under mineral leasing acts ..	148	Ground Water, Division of	61
Receipts under the Taylor Grazing		Surplus Water, Division of	60
Act	149	Federal bureaus	59
Repayments	150	Permittees and Licensees of the Federal	
Rights-of-way	152	Power Commission	59
State grants and selections	153	States	59
Status sheets	158	Power Resources, Division of	65
Supplemental patents	158	Quality of Water, Division of	63
Swamp and overflowed lands	153	Water Utilization, Division of	64
Timber	156	Work of the year, by States	61
Town plots and town sites	156		

	Page		Page
Geological Survey—Continued.		Howard University—Continued.	
Work on publications.....	72	General trend of the university.....	503
Distribution.....	73	College of liberal arts takes important steps to improve quality of instructions.....	505
Engraving and printing.....	73	Division of social sciences sponsors public lectures.....	505
Geologic map editing and drafting.....	73	Four additional divisions of the university accredited.....	504
Illustrations.....	73	Increased number and caliber of students.....	504
Texts.....	72	Medical school continues to go forward.....	506
Grazing Service.....	330	Outstanding needs of the university..	507
Civilian Conservation Corps.....	351	Physical-plant improvements.....	504
Accomplishments.....	352	Postgraduate courses established in dentistry.....	505
Range management, range development and related projects..	353	Progress of the special Negro library collection.....	505
Soil protective and range productive projects.....	353	School of law gives decisive help in important civil rights cases.....	506
Communication.....	352	School of religion makes significant advances.....	506
Safety and education.....	351	Successful civilian pilot training program.....	505
Training.....	351	Status and progress under ten-year plan.....	503
Cooperation.....	339	Student body and resources.....	503
Cooperation with Office of Indian Affairs.....	341	Graduate school.....	511
Cooperation with Bureau of Biological Survey.....	341	Library.....	518
Cooperation with the Bureau of Reclamation.....	340	Gifts.....	518
Cooperation with the National Park Service.....	341	Statistics for the university libraries..	518
Cooperation with the Southern Pacific Land Co.....	340	Military science and tactics.....	513
Growth of the Grazing Service.....	332	Commissions awarded.....	513
Land classification.....	338	Enrollment.....	513
Lands.....	336	Unit rated as "excellent".....	513
Establishment of grazing districts....	337	School of engineering and architecture....	514
Miscellaneous grazing district modifications.....	337	School of law.....	517
Status of grazing districts—approximate acreage, 1940.....	338	Library.....	517
Operations.....	335	School of music.....	514
Organization.....	334	School of religion.....	517
Pierce Act leases.....	338	Students.....	507
Range improvements.....	349	Geographical distribution.....	508
Maintenance.....	350	University enrollment.....	507
Range improvements by licensees.....	350	Students of graduate caliber.....	508
Records.....	350		
Range management.....	341	Indian Affairs, Office of.....	354
Advisory boards.....	343	Arts and crafts.....	394
Appeals and hearings.....	347	Alaska.....	397
Enforcement.....	347	Teachers help in census taking.....	398
Fire protection.....	344	Councils of field administrators.....	394
Range surveys.....	342	Effort toward better personnel.....	392
Carrying capacity surveys.....	343	Government does not pension tribes..	378
Dependent property surveys.....	342	Indians receive credit.....	375
Range studies.....	343	Expansion of Indian beef cattle industry.....	375
Squaw Butte Range and Livestock Station.....	344	Indian irrigation.....	377
Utilization studies.....	343	Irrigated lands and Indian self-support.....	378
Wildlife.....	346	Lands restocked for production.....	374
Howard University.....	503	Livestock associations.....	376
College of dentistry.....	516	Indian employment.....	389
College of liberal arts.....	513	Indian health.....	379
College of medicine.....	515	Death rate is declining.....	384
College of pharmacy.....	516	Health through education.....	380
Finances.....	519	Navajo use own funds for dentistry...	381
Assets.....	519		
Audit of funds.....	519		
Income and expenditures.....	519		

	Page		Page
Indian Affairs, Office of—Continued.		National Park Service—Continued.	
Indian health—Continued.		Civilian Conservation Corps cooperation	
Research in trachoma and other dis-		in park work.....	201
eases.....	382	Coronado Cuarto Centennial cooperation.....	185
Indian population.....	362	Emergency Relief Act projects.....	202
Land.....	366	Expansion of the Federal Park System....	185
Allotments hamper land use.....	369	Changes in existing Federal park	
Indian Civilian Conservation Corps		areas.....	186
protects forests and ranges.....	373	Further additions to existing Federal	
Land losses cease.....	367	park areas.....	187
Livestock reduced to save land.....	370	Acadia National Park, Maine.....	187
Timber resources conserved.....	372	Atlanta campaign markers.....	187
Tribes buy back their lands.....	368	Badlands National Monument....	187
Schools and the use of Indian resources....	384	Blue Ridge Parkway.....	187
Changed requirements for teachers....	385	Boulder Dam National Recrea-	
Day schools are community centers.....	388	tional Area.....	187
Beginners learn conservation.....	387	Capitol Reef National Monu-	
Summer schools for in-service training..	385	ment.....	187
Textbooks in two languages.....	386	Chaco Canyon National Monu-	
Tribal self-government.....	363	ment.....	187
Two decades in review.....	357	Chalmette National Historical	
Information, Division of.....	474	Park.....	187
Photographic Section.....	475	Fredericksburg and Spotsylvania	
Publications Section.....	476	County Battlefields Memorial	
Radio Section.....	475	National Military Park, Va....	187
Investigations, Division of.....	435	Glacier National Park.....	187
Cooperation with other agencies.....	436	Grand Canyon National Park....	187
Summary.....	440	Great Sand Dunes, Colo.....	187
Expenditures.....	440	Great Smoky Mountains Na-	
Letter of transmittal.....	v	tional Park.....	187
Mines, Bureau of.....	1	Guilford Courthouse National	
Finances.....	35	Military Park, N. C.....	187
Future work.....	5	Jefferson National Expansion Me-	
Review of the year's work.....	7	morial project.....	187
Technologic Branch.....	7	Kennesaw Mountain National	
Coal Division.....	7	Battlefield Site.....	187
Mining Division.....	10	Mammoth Cave National Park,	
Metallurgical Division.....	12	Ky.....	187
Petroleum and Natural Gas Divi-		Natchez Trace Parkway.....	187
sion.....	15	Petersburg National Military	
Nonmetal Division.....	18	Park, Va.....	188
Explosives Division.....	21	Petrified Forest National Monu-	
Coal Economics Division.....	23	ment, Ariz.....	188
Economics and Statistics Branch.....	23	Rocky Mountain National Park..	188
Petroleum Economics Division....	24	Shenandoah National Park.....	188
Mineral Production and Eco-		Vicksburg National Military	
nomics Division.....	25	Park, Miss.....	188
Metal Economics Division.....	27	White Sands National Monu-	
Nonmetal Economics Division....	23	ment.....	188
Foreign Minerals Division.....	29	Yellowstone National Park.....	188
Health Division.....	30	Yosemite National Park.....	188
Health and Safety Branch.....	30	National monuments established and	
Safety Division.....	32	other areas transferred to Service..	186
Information Division.....	34	National parks established.....	186
Administrative Branch.....	34	New designations.....	186
Office Administration Division....	35	Proposed additions to Federal Park	
Museum, Department.....	479	System.....	190
National Park Service.....	162	Adirondack National Recreational	
Accommodations furnished by park		Area, N. Y.....	190
operators.....	196	Coronado International Monu-	
		ment, Ariz.....	190
		Escalante, southeastern Utah....	191
		Manuelito, N. Mex.....	191
		Oregon Coast National Park,	
		Oreg.....	190

	Page
National Park Service—Continued.	
Expansion of the Federal Park System—Continued.	
Proposed additions to Federal Park System—Continued.	
Rehoboth-Assateague National Seashore, Delaware, Maryland, Virginia.....	190
Saint John Island National Recreational Area, Virgin Islands..	191
Ship Island, Miss.....	191
Tensas Swamp National Park, La.....	190
Proposed extensions to existing Federal park areas.....	188
Kings Mountain National Military Park, S. C.....	188
Rocky Mountain National Park, Colo.....	188
Status of Federal park areas authorized by Congress.....	188
Andrew Johnson Homestead National Monument project, Tennessee.....	189
Big Bend National Park project, Texas.....	188
Cape Hatteras National Seashore Recreational Area project, North Carolina.....	189
Cumberland Gap National Historical Park project, Tennessee, Kentucky, Virginia.....	188
Everglades National Park project, Florida.....	189
Monocacy Military Park project, Maryland.....	189
Patriek Henry National Monument project, Virginia.....	189
Richmond National Battlefield Park project, Virginia.....	189
Saratoga National Historical Park project, New York.....	189
Forest protection and fire prevention.....	191
C. C. C. assistance in forest protection.....	192
Campground protection.....	193
Detection system.....	192
Fire equipment.....	192
Fire record.....	191
Fire-protection training.....	192
Forest nurseries and planting.....	194
Insect control.....	192
Protection planning.....	192
Type mapping.....	194
White pine blister rust.....	193
Historic American buildings survey.....	174
Historic and archeologic sites survey.....	174
Information Service.....	183
New printing procedure for park literature.....	183
Encyclopedias and almanacs.....	185
Lectures.....	184
Radio.....	184
Interpretive service and scientific research.	176
Conservation in park development...	178
Fish conservation.....	182
Museums.....	178

	Page
National Park Service—Continued.	
Interpretive service and scientific research—Continued.	
Naturalist training.....	176
Progress in research.....	177
Reduction of grazing by domestic stock.....	181
Wildlife management.....	180
Wildlife studies.....	179
Memorials.....	175
Jefferson National Expansion Memorial, St. Louis, Mo.....	175
Mount Rushmore National Memorial, S. Dak.....	175
Thomas Jefferson Memorial, Washington, D. C.....	175
National Capital parks.....	198
Parkway development.....	196
Planning and construction.....	194
Engineering laboratory.....	195
Field radio systems.....	195
Recreational demonstration areas.....	202
Sanitation and safety precautions.....	199
State relationships.....	171
The park, parkway, and recreational area study.....	170
The year's high lights.....	163
Use and development of historic areas.....	171
Regionalization increasingly effective.....	168
United States Travel Bureau approved by Congress.....	169
Petroleum Conservation Division.....	219
Cost of administration.....	221
Examinations outside the east Texas area.....	221
Operations in the east Texas area.....	219
Summary of east Texas refinery operation, 1940 fiscal year.....	221
Special investigations and litigation.....	221
Puerto Rico Reconstruction Administration..	421
Cooperatives.....	426
Cooperatives with which the cooperative Division of the P. R. R. A. is working.....	429
Lafayette Sugar Cooperative.....	426
Los Canos Sugar Cooperative.....	427
Other cooperatives.....	429
Vanilla cooperative.....	428
Vegetable cooperatives.....	427
Coordinated activities with other Federal and insular agencies.....	425
Federal experiment station (U. S. Department of Agriculture).....	426
Insular agricultural extension service (University of Puerto Rico).....	425
Insular department of agriculture and commerce.....	425
Engineering.....	432
Forestry.....	431
Other forest activities.....	431
Parceleros.....	431
Housing management.....	430
Rural electrification.....	433
Rural rehabilitation.....	422
Land utilization.....	422

	Page		Page
Puerto Rico Reconstruction Administration—Continued.		Reclamation, Bureau of—Continued.	
Rural rehabilitation—Continued.		Reclamation fund—Continued.	
Livestock and poultry.....	422	Repayments.....	97
Loans to needy farmers.....	423	Status of reclamation fund.....	97
Tick eradication.....	423	Relief extended to water users.....	104
Rural sanitation and health.....	423	Repayment legislation.....	103
Social Service.....	430	Secondary and general investigations.....	110
Soil conservation.....	424	Stabilization of the Great Plains.....	83
The future.....	434	Additional projects authorized for construction.....	85
Reclamation, Bureau of.....	82	Columbia Basin joint investigation.....	86
Civilian Conservation Corps.....	114	Policies regarding opening of lands for settlement.....	86
Construction program.....	88	Transmission lines.....	87
Boulder Canyon project.....	92	St. Elizabeths Hospital.....	481
Central Valley project.....	91	Administrative Department—Office of the Assistant to the Superintendent.....	487
Colorado-Big Thompson project.....	93	Medical Department.....	482
Grand Coulee Dam.....	90	Movement of population.....	481
Marshall Ford Dam.....	93	Movement of patient population, fiscal year 1940.....	482
Other construction.....	94	Needs of the hospital.....	492
Crop results.....	104	New legislation.....	491
Irrigation and crop results on Federal reclamation projects, 1939.....	106-109	Publications.....	493
Cumulative constructive results.....	95	Solicitor, Office of the.....	441
Land opened to homestead entry.....	102	Territories and Island Possessions, Division of.....	408
Operation and maintenance.....	102	Antarctic Service Expedition.....	409
Organization.....	116	Puerto Rico.....	413
All-American Canal.....	124	Territory of Alaska.....	409
Boulder Canyon project.....	123	The Alaska Railroad.....	411
Boulder Dam, power plant, and appurtenant works.....	123	The Alaska Road Commission.....	411
Irrigated acreage and areas in cultivation and cumulative crop values, by years, 1906-39.....	117	Territory of Hawaii.....	412
Population of the projects.....	100	The Philippine Islands.....	418
Settlement and economic data, fiscal year 1940.....	101	National Assembly of the Philippines.....	420
Power.....	95	Virgin Islands.....	415
Reclamation fund.....	96	The Virgin Islands Co.....	416
Accounts receivable, construction water-right charges.....	98	War Minerals Relief Commission.....	471
Accounts receivable, operation and maintenance charges (after public notice).....	99	Review of work.....	471
Accounts receivable, rentals of irrigation water.....	100	Acts of February 13, 1929.....	472
Accretions to reclamation fund, by States.....	96	Act of May 18, 1936.....	472
		Act of June 30, 1936.....	472
		Summary.....	473



Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225

Borrower's

HD
181
.A5
1940

Annual report o
Interior.

Date	
Loaned	Borrower

